1st International Conference

On

RECENT APPLICATIONS IN ADVANCED MATERIALS

IC-RAAM 2019

On 11th & 12th July 2019

SOUVENIR

Chief Editor

Dr. D. SAKTHI, Principal

Editors

Mr. M. SIVAKUMAR, Assistant Professor & Head
Department of Chemistry
Mr. V. ARUN, Assistant Professor & Head
Department of Physics
Dr. S. SIVAKUMAR, Assistant Professor
Department of Chemistry
Dr. N. KANNADASAN, Assistant Professor
Department of Physics
Dr. S. RAGUPATHY, Assistant Professor
Department of Physics

Organized By

Sir. C.V RAMAN ASSOCIATION,
DEPARTMENTS OF PHYSICS & CHEMISTRY,
E. R. K ARTS AND SCIENCE COLLEGE
(Affiliated to Periyar University& Recognized Under Section 2(f) and 12(B) of the UGC Act 1956)
Erumiyampatti, Dharmapuri Dt, Tamilnadu, India
Ph: +91 4346 242777, Website: www.erk.co.in, E-Mail: erkasc@gmail.com
&
INDIAN SCIENCE AND TECHNOLOGY ASSOCIATION
&
ELAVENIL ORGANIZATION, Chennai, Tamilnadu, India.

FROM THE DESK OF ORGANIZERS

Dear Participants,
Greetings!

The E.R.K Arts & Science College, a committed Institution for molding Women folk on making a revolution in them takes much pride in organizing this International Two Day Conference on IC-RAAM2019.

The Departments of Physics and Chemistry are always active in providing a platform for Scholarly interactions and deliberations with renowned academicians and Scientists. Today it is organizing a Two day International Conference on **"RECENT APPLICATONS IN ADVANCED MATERIALS**". It ponders to cultivate the youngsters in order to meet the need of our diverse society. In the 21st century Material Sicence plays a vital role in economic and social development throughout the world. So this Scenario will definitely help to exchange global scientific knowledge.

Advanced Materials play a major role in all the sectors of the economy especially production of efficient Photo catalytic, Photo Volotaic like that. It offers a bright future for the innovative and growth oriented students. Due to increasing demand for the researches, it has become the most preferred career option all over the world. Advanced Materials can be applied in various sectors such as in DSSC, Photo catalytic, Biosensors, and Dielectrics like that. This seminar will helps to know the recent applications and some research methods in the Advanced Materials.

We are glad to inform you that eminent scientists from various spheres are going to deliver key note lectures on the glimpses of future prospects of Advanced Materials. We hope this conference will offer a platform for students to interact with scientists and eminent Professors and provide an opportunity to get exposure to the latest developments in the field of Material Science.

We express our sincere thanks to all the delegates, participants, management, faculty members and media and others for their cooperation and support in amking this conference a grand success.

We also thank sincerely all those who have responded positively and sent their research articles. Your contributions show your strong passion for enhancing your knowledge in the domain of Material Science and its related research activities.

Best Wishes!

CONVENER

With the blessings of our Chief Patron !!!

Mr. E. R. SELVARAJ,

Correspondent,
E.R.K Educational Institutions,
E.R.K ARTS AND SCIENCE COLLEGE,
(Affiliated to Periyar University)
Erumiyampatti – 636 905
Dharmapuri, Tamil Nadu, India,
☎: 04346- 242777
Website: www.erk.co.in,
E-Mail: erkasc@gmail.com

Dr. D. SAKTHI, M.Sc., M.Phil., B.Ed., Ph.D., PGDCA.
Principal
E.R.K Arts & Science College
Erumiyampatti – 636 905
Dharmapuri, Tamil Nadu, India

It gives me immense pleasure to learn that the Departments of Physics & Chemistry are organizing a Two day International Conference on **"RECENT APPLICATIONS IN ADVANCED MATERIALS"***. The Conference will serve as a platform for technical deliberations on the various fronts of Material Science. We hope that the invited speakers and the paper presenters will highlight all the important issues pertaining to the present day scenario of Material Science. Further this Conference will help to strengthen the relations with prominent scholars and renowned Scientists.*

I appreciate all the faculty members and the Students for their involvement and excellent work done by them to make the Conference a wonderful event. I take this opportunity to thank the resource persons, delegates, sponsors and well-wishers for their contribution to make this Conference a successful one.

As the Patron of the International Conference, I would like to express my appreciation to the Departments of Physics and Chemistry for their commendable efforts in bringing out a radiant proceedings of the International Conference

Wish you all a success!!!

PATRON

[D.SAKTHI]

Mr. M. SIVAKUMAR M.Sc., M.Phil.,
Convener
Assistant Professor and Head
Department of chemistry
E.R.K Arts and Science College
Erumiyampatti – 636 905
Dharmapuri, Tamil Nadu, India

I welcome the participants of ICRAAM 2019. The main goal of organizing this conference is to share and enhance the knowledge of each and every individual in this modern world. We have given a good opportunity for those who have a thirst in knowing the present technological developments and also share their ideas. Furthermore, this conference will also facilitate the participants to expose and share various novel ideas regarding Material Science. The conference aims to bridge the researchers working in academia and other professionals through research presentations and keynote addresses in current technological trends. It reflects the growing importance of intelligent Computing systems as a field of research and practice. You will get ample opportunities to widen your knowledge and network.

I thank the conference committee for extending their valuable time in organizing the program and all the authors, reviewers, and other contributors for their sparkling efforts and their belief in the excellence of ICRAAM 2019.

CONVENER
[M.SIVAKUMAR]

Mr. V. ARUN M.Sc., M.Phil., B.Ed.,
Organizing Secretary
Assistant Professor and Head
Department of Physics
E.R.K Arts and Science College
Erumiyampatti – 636 905
Dharmapuri, Tamil Nadu, India

As the Organizing Secretary of A Two day International Conference on ***"RECENT APLLICATIONS IN ADVANCED MATERIALS",*** *I would like to register my sincere thanks and Gratitude to every stakeholder of this conference.*

Material Science is expected to be a major field in near future. So it is the need of hour to utilize all the available energies properly. At Present, most researches activities try to make solar cell with good efficiency, waste water treatment through photo catalytic activity, Bio sensors, dielectrics like Advanced Materials applications. So this Conference will help to be familiar with recent trends in the Material Science.

I am very much indebted to the Management, Principal, Organizing Committee Members and Everyone who are directly or indirectly contributed for this International Conference.

Your support and Cooperation deserved every bit of Appreciation.

ORGANIZING SECRETARY

[V.ARUN]

PERIYAR UNIVERSITY

NAAC Reaccredited 'A' Grade - State University

Salem - 636 011, Tamil Nadu, India

Professor P. Kolandaivel

Vice Chancellor

Date: 07-07-2019

Message

I am very happy to know that the Departments of Chemistry and Physics of ERK Arts and Science College, Erumiampatti in collaboration with Indian Science and Technology Association and Elavenil is organizing a two days International conference on Recent Applications of Advanced Materials (RAAM-2019) during 11th and 12th July 2019.

The advanced materials are widely used in all fields of science, engineering and medicine. Even though, the numbers of advanced materials are available, materials with improved multifunctional properties are rarely existing. So, focused research, deliberations and discussions are very essential for synthesis new materials. Definitely the outcome of the conference will be very much useful to budding scientists working in the fields of physics, chemistry and engineering.

I congratulate the Department of Chemistry and Physics, ERK College of Arts and Science, Erumiyampatti for organizing such a useful conference.

P. Kolandaivel

[Prof. P. Kolandaivel]

PERIYAR UNIVERSITY * VICE CHANCELLOR OFFICE * SALEM-636 011

Telephone 0427-2345161 (O) | Res 0427 - 2345464 | Fax 0427-2345565 (O) | E-mail vcperiyar@gmail.com | Website www.periyaruniversity.ac.in

Indian Association for Crystal Growth (IACG)
Office: Dean (Research)
SSN College of Engineering
Chennai-603110, Tamilnadu, INDIA
Telephone : +91-9283105760
Fax : +91-044-27475166
Email: ramasamyp@ssn.edu.in

Prof.P.RAMASAMY
President

Prof. P. RAMASAMY
Former Vice Chancellor, Alagappa University,
Karaikudi, Tamilnadu
Founder Director, Crystal Growth Centre, Anna University
Chennai, Tamilnadu

MESSAGE

I am happy that the Department of Physics & Department of Chemistry, E.R.K College of Arts and Science College Erumiyampatti is organizing the **"International Conference on Recent Applications in Advanced Materials (IC-RAAM 2019)"** during 11th &12th July 2019. The conference would involve active participation and healthy discussion among hundreds of researchers, including pioneers in the field of Materials Science. I am sure the eminent resource persons with their wide experience in Materials Science will be able to provide a new impetus to the budding researchers. I am confident that this would give them a good platform for exchange of ideas.

To be a successful lifetime researcher one must ensure, all the time, an updated knowledge of the current developments in one's own chosen field. This necessitates, among other things, participation in serious Scientific Conferences. Physical participation in conferences creates lasting interests, impressions and new bonds of friendship and networking which potentially are stronger and are likely to last longer. I understand that there are 12 invited Lectures and 150 contributed Papers. Though organizing a conference of this nature is a huge task the rich experience of the organizers will certainly ensure successful conduct of the programme.

I congratulate the Convener of this conference and organizing committee of **IC-RAAM 2019** for their dedicated work in making this event a great success. Several distinguished scientists are attending this conference and I am sure all the delegates will be benefited by the deliberations in the conference. I wish the **IC-RAAM 2019** a grand success.

I am delighted to acknowledge the solid support extended by the principal and the management of E.R.K College of Arts and Science College to the organizers of this important international event of Materials Science community of our country.

Dr. P. RAMASAMY

E-mail: deanresearchspu@gmail.com

Dr. S. Gunasekaran, M.Sc.,Ph.D.,D.Sc.
TANSA Awardee
Dean, Research & Development
St. Peter's Institute of Higher Education & Research
Avadi, Chennai – 600 054. Tamil Nadu. India.
E-mail: deanresearchspu@gmail.com
Founder President. Indian Spectrophysics Association (ISPA)
Former Registrar, Periyar University, Salem
Former Head, Department of Physics, Pachaiyappa's College, Chennai.

E-mail ispa.org@ispa.wiki
Website www.ispa.wiki

Date: 04/07/2019

Dr. S. Gunasekaran

MESSAGE

I am extremely glad to note that Department of Physics and Chemistry and Sir C V Raman Association of E. R. K. Arts and Science College, Erumiyampatti is organizing an Inter**national Conference on Recent Applications in Advanced Materials (ICRAAM 2019)** during 11 - 12 July 2019. Noteworthy developments have been reported in advanced materials that involves a rapid change in the recent technology. These rapid changes show an impact of progress in our society. The international conference is a timely one and I express my special appreciation to the college for their efforts and hardwork. I hope this conference will motivate our younger minds towards advanced materials.

I, on behalf of ISPA would like to place on record my sincere appreciation and congratulate the Patron, **Dr. D. Sakthi**, Principal, Convenor, **Mr. S. Sivakumar**, Professor and Head, Department of Chemistry, Organising Secretary, **Mr. V. Arun**, Assistant Professor and Head, Department of Physics and all the **Co-ordinators** and **Committee members** who are collectively responsible for organizing the International Conference and making it a truly memorable and successful event. I wish a grand success for the conference.

04/07/19

Dr. S. Gunasekaran
Dean (R&D)

Indian Science And Technology Association
Elavenil
(Regd.110/2015)
163/69, Secretariat colony, Kilpauk , Chennai-600 010, India
Email: istaindia18@gmail.com

Dr. M. Srinivasan
Director

MESSAGE

Material science is a diverse field of research in modern science and technology which plays an important role in various fields like Electronics, Medicine, Biotechnology, Energy, Crystallography, Spectroscopy, Information and Communication Technology. It is one of the current emerging fields and it is believed that it will bring a wave of radical innovation and will spark new industrial revolution in various application areas.

I am very happy to know that the Department of Physics, E.R.K College of Arts and Science College, Erumiyampatti is organizing the **"International Conference on Recent Applications in Advanced Materials (IC-RAAM 2019)"** during 11-12, July 2019. The aim of organizing such a conference will provide a platform for knowledge dissemination and knowledge sharing. I hope the participants would be very much benefited out of this event by getting the details of recent developments in the field of Material science and modeling.

I congratulate the conveners **Mr. M. Sivakumar** and organizing committee for the untiring work to organize the conference in a successful manner.

Also I would like to thank in special way **Dr. D. Sakthi**, Principal, E.R.K College of Arts and Science College, and the management motivation and cooperation to organize the conference in a grand manner.

Dr. M. Srinivasan

Dr.A.SUBRAMANIA, ***Ph.D FRSC***
Professor

Centre for Nanoscience &Technology
Pondicherry University
(A Central University)
Puducherry – 605 014, India

E-mail : a.subramania@gmail.com **Phone: +91 94431 10537** **Fax : 0413-2654866**

08-7-2019

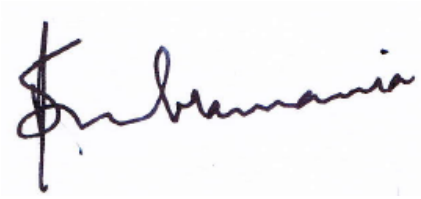
MESSAGE

I am very happy to know that the Departments of Physics & Chemistry, ERK Arts and Science College, Erumiyampatti-636 905 is organizing a two day "**International Conference on Recent Applications in Advanced Materials"** on 11th and 12th July 2019.

I am sure that the International Conference will be useful to the participants and will provide an excellent opportunity for wide- range of discussions on various dimensions of Physics and Chemistry.

I am sure that the deliberations of this Conference will go a long way in promoting the Research activities in Physics and Chemistry. Besides, the students and Research scholars especially from this rural area will get more benefits from their participation in this Conference.

I wish the seminar a great success...



(SUBRAMANIA A)

Dr. K. GUNASEKARAN
Assistant Professor
Department of Crystallography and Bio Physics
University of Madras
Chennai, Tamil Nadu, India

MESSAGE

Literary is the basic need of any society in turn which makes a nation educated. Higher education that pave platform for younger generation work closely with experienced ones can makes a nation to develop and stand proudly in the globe. India, though exhibited very strong knowledge and wisdom in the past, we have witnessed a fall back in last two or three decades. When we moved from classical methods of teaching-learning, adequate ambience is not developed particularly in rural colleges and institutions.

Independent thinking, creativity and healthy discussion in every corner of education, particularly in higher education is the need of the hour. By realizing this fact, efforts have been taken to create such scientific ambience in every college. Solely because of experienced and motivated teachers, now colleges, particularly in Tamil Nadu start to engage in academic research. Though infrastructure is not adequate in many colleges, dedicated and well trained teachers are now rendering their earnest efforts to do good research work and train students in the appropriate way. In the course of evolution, it is inevitable that many paradigm shifts are witnessed. Similarly, number of publications was encouraged in last decade and now quality of publications is insisted. Patents, product developments and industrial collaborations are now insisted. These implementations are needed to ensure better future for the nation. Also, creating scientific environment in colleges where students gain all the qualities to enjoy and do science is utmost importance and urgent.

To reach the objective, apart from teaching and research, college teachers engage in seminars, conferences to make students aware of recent developments in research, tools available for conducting new experiments and even about research opportunity available worldwide.

ERK Arts and Science College, with many years of public service, now, has taken extended step to create research ambience in the college which, I am sure, will spread useful flavors of science among students.

This college is organizing this symposium (IC-RAAM2019) to meet the above said goals. Departments of physics with many good academicians and researchers as teachers now organize this important event.

I am sure this will be an appreciable feather in the crown of this college. I register my wishes for the success of the conference and all future endeavors of the department and ERK Institutions.

Dr. K. GUNASEKARAN

Periyar University PG Extension Centre

(Reaccredited with NAAC 'A' Grade)

Dharmapuri – 636 705

E-mail:mselvapandiyan@rediffmail.com, **Mobile:** 9976493935

Dr.M.Selvapandiyan M.Sc., M.Phil., Ph.D

Associate Professor and Head i/c

Date: 08.07.2019

I am extremely glad to note that **Department of Physics, ERK College of Arts and Science for Women, Erumiyampatti, Dharmapuri Dt, Tamilnadu, India is** organizing first International Conference on **RECENT APPLICATIONS IN ADVANCED MATERIALS (IC-RAAM 2019)** on 11 and 12 July, 2019. In the last two decades, noteworthy developments have been reported in Advanced Materials which involves a rapid change in medical, energy, communication, material thinking, Micro/Nano/Electro/ Mechanical Systems and Environment. These developments show an impact in our way of life as well as in the progress in human civilisation.

This conference is timely one and my congratulations and best wishes to the convener **Mr.M.Sivakumar**, Assistant Professor and Head, Department of Chemistry and Organizing Secretary **Mr.V.Arun,** Assistant Professor and Head, Department of Physics, ERK College of Arts and Science for Women, Erumiyampatti, Dharmapuri Dt for being a successful skippers in uniting their team to bring out this scientific mega event as a victorious one. Also I convey my heartfelt gratitude and wishes to Correspondent and Chief Patron **Mr.E.R.Selvaraj** for taking effort and interest to motivate the faculties to organize useful and relevant conference for the development of Students and as well as Nation. I extend my wishes and thanks to **Dr. D.Sakthi,** Principal and Patron for his passionate way of motivating the faculties and support to organize the application oriented conference.

Our Nation is in the spree of development. This could be had by proper deliberations and applications of the novel concepts for the national development. It needs more workshops and conferences to motivate our younger minds to tread on the path of applications in Advanced Materials. Advanced Materials provides solution to every question of the knowledge craving infra and space industries. I wish a grand and colorful success of the International Conference and the deliberations of the conference will be highly useful to younger researchers.

I once again congratulate each and everyone worked behind the screen to make IC-RAAM 2019 grand gala and eventful one for the years to cherish and remember in the annals of the College.

(Dr.M.Selvapandiyan)

Dr. P. Vijayan, M.Sc, B.Ed, Ph.D.,
School of Chemistry & Physics,
College of Agriculture, Engineering & Science,
University of KwaZulu-Natal,
Pietermaritzburg Campus,
Private Bag X01, Scottsville 3209,
South Africa.
Email : ParanthamanV@ukzn.ac.za
pvijayanmsc@gmail.com

I am happy to know that Sir CV Raman Association of E.R.K Arts and Science College, Erumiyampatti and Indian Science and Technology Association & Elavenil is organizing ai nternational conference on "Recent Applications in Advanced Materials" (IC-RAAM 2019) on 11.07.2019. Advent of modern materials made great change in human life and culture. Studying the chemistry of materials helps us to understand three-dimensional network arrangements at molecular-level hence design and control synthesis of nano materials, such as catalysts, bio sensors, crystalline solids and thin film materials. Recent developments in the field of materials chemistry helped us to develop novel heterogeneous catalysts useful for the preparation of chemicals in large scale with minimum impact on the environment. Thus, it is important for all of us to understand and debate about chemistry of materials. I believe that the organizers of this conference have identified right theme at right time.I am sure this conference would serve as a platform for the participants to share and updatetheir knowledge. I wish the conference a grand success.

(P. Vijayan)

E-mail: ParanthamanV@ukzn.ac.za
Cell Phone: 09865318664

UNIVERSITY OF MADRAS
Department of Analytical Chemistry
Guindy Campus, Chennai 600 025, India.

Dr.T.M. Sridhar M.Sc., Ph.D, ME (BME)
Assistant Professor and Head i/c

Phone: +91- 44- 22202715/19
M: +91-9444407615
Email:tmsridhar@gmail.com; sridhar@unom.ac.in

Secretary, Society for Biomaterials and Artificial Organs (India), *www.sbaoi.org* ***& EC Member, STERMI,*** *SBAOI is a member of International Union of Societies for Biomaterials Science and Engineering (IUS-BSE)*
Vice President, Indian Society of Analytical Scientists (ISAS), *Madras Chapter, Chennai*
EC Member NIGIS, (NACE International Gateway India Section)& NIGIS South Zone, *www.naceindia.org*
Joint Secretary, Society for Advancement of Electrochemical Science and Technology (SAEST), *Chennai Chapter*

Dated: 09. 07. 2019

Research and Development is an integral part of higher education and this calls for consistent and continuous interaction among the professionals and researchers. I am happy to note that Sir CV Raman Association along with two departments of Physics and Chemistry of **E.R.K Arts and Science College, Dharmapuri**, **Tamil Nadu, India are** together organizing the first '**International Conference on Recent Applications in Advanced Materials (IC-RAAM2019).** There is no life on earth without materials – human beings to space shuttles, automobile to robots and other fields and this conference is being organised in this vital area of research today.

The invited talks by eminent experts in this field and paper and poster presentations will provide an opportunity for exchange of knowledge on recent developments in the field of advanced materials. I am sure that the conference would bring together young students, researchers, material scientists and academicians to a common platform for a very fruitful interaction leading to creative ideas and innovative solutions for the various challenging problems in the field of advanced materials.

I appreciate the enormous efforts taken by the members of various committees for organizing this International conference. I wish the conference a grant success.

Best Wishes

T.M. Sridhar

Dr. R. SASIKUMAR
Assistant Professor and Head i/c
Department of Physical Chemistry
University of Madras
Guindy Campus
Chennai -600 025

MESSAGE

I am glad very delighted to convey my warm greetings of the Department of Physics and Chemistry, E.R. K. Arts and Science College, Erumiyampatti, Dharmapuri - 636905 Tamil Nadu, is organizing **"International Conference on Recent Applications in Advanced Materials" (IC-RAAM2019),** on 11-12th July 2019, I feel privileged to pen down a few words about the conference.

The modern science has changed our life tremenously due to the development of new innovative ideas in science and technology. Chemistry is the said to be the Central Science. It is a highly advanced interdisciplinary science. The applications of any advanced science and engineering is to help the nation for its development. It is well known that conventional method of energy conversion/ harvesting and its related environmental impacts are the greatest challenge in recent years. This method of energy conversion is leading to climate change and unsustainable activity as well. Researcher in the present day scenario has a challenge to provide reliable electrical energy supplies. It is essential for those professionals of electrical power to get newest updates of electrical energy and its advanced applications to meet the challenges. Hence, it is very important to conduct conferences, seminars and symposium to bring the active researchers to one platform in order to get new ideas and to share knowledge. Such a conference has been organized.

In such a way to update contemporary knowledge to all researchers by renowned experts and to provide them new insight and guidance in these fields. This conference is likely to be one of the finest opportunities for the chemists, technocrats, scholars and students and to share ideas over the same dais.

I congratulate and share my appreciation for the strenuous efforts taken and never-say-die spirit shown by the Management, Principal, Head and Faculty Members of Department who have been dedicated to their work. I wish them all the very best in their future. Wishing all the delegates and Participants a technically rewarding conference and memorable stay in Dharmapuri during **(IC-RAAM2019).**

[Dr. R. SASIKUMAR]

Dr. P. MAADESWARAN, M.Sc., M.Phil., Ph.D.,
Assistant Professor
Department of Energy Studies
Periyar University
Salem – 636 011
Tamil Nadu, India

In the modern era of science and technology, Nanotechnology plays a vital role. Dodging the development with new, renewable green energy sources to the advancements is unpardonable but to kindle interest and awareness among the students, researchers, professors and scientists, **The Departments of Physics and Chemistry**, **Sir C V Raman Association, E. R. K. Arts & Science College, Erumiyampatti, Dharmapuri District, Tamil Nadu, India,** has organizing a International Conference on **"RECENT APPLICATIONS IN ADVANCED MATERIALS"**.

I am extremely happy and proud that the **Departments of Physics AND Chemistry, E. R. K. Arts & Science College,** Erumiyampatti, Dharmapuri District, Tamil Nadu, has come forward in organizing **Interational Conference** on 11th and 12th, July 2019.

It is appropriate to extend my greetings and felicitation to **The Chief Patron** of this Conference **Mr. E. R. Selvaraj,** Correspondent, E.R.K. Educational Institutions, for his enthusiastic encouragement and support for this scientific event.

I also extend my felicitations and compliments to **The Patron, Dr. D. SAKTHI,** Principal, E. R. K. Arts & Science College, Erumiyampatti, Dharmapuri District, Tamil Nadu, for being a pillar of support in organizing the conference.

Also I also extend my wish to **The Convener, Mr. M. SIVAKUMAR,** Assistant Professor and Head, Department of Chemistry, E. R. K. Arts & Science College, Erumiyampatti, Dharmapuri District, Tamil Nadu for taking effort in the conference.

I deem it a pleasure to wish the **Organizing Secretary** of the conference **Mr. V. Arun**, Assistant Professor and Head, Department of Physics, E. R. K. Arts & Science College, Erumiyampatti, Dharmapuri District, Tamil Nadu. His rapport towards the successful happening of this International Scientific event is remarkable.

I once again congratulate each and every one, who worked behind the screen to make this event razzmatazz and nostalgic.

P. maadeswaran

Dr. P. MAADESWARAN

ORGANIZING COMMITTEE

Chief Patron

Mr. E. R. SELVARAJ, *Correspondent*

E.R.K Educational Institutions

Patron

Dr. D. SAKTHI, *Principal*

Convener

Mr. M. SIVAKUMAR,

Assistant Professor and Head, Department of Chermistry

E.R.K Arts & Science College

Organizing Secretary

Mr. V. ARUN,

Assistant Professor and Head, Department of Physics

E.R.K Arts & Science College

Organizing Committee Members

Mr. N. SIVA, *Assistant Professor*

Mr. M. RAMAMOORTHY, *Assistant Professor*

Dr. N. KANNADASAN, *Assistant Professor*

Dr. S. RAGUPATHY, *Assistant Professor*

Mrs. N. V. PODHUMA, *Assistant Professor*

Dr. K. ANNALAKSHMI, *Assistant Professor*

Mrs. M. PRIYA, *Assistant Professor*

Department of Physics

E.R.K Arts and Science College

Dr. S. SIVAKUMAR, *Assistant Professor*

Mr. A. SANTHOSHKUMAR, *Assistant Professor*

Mr. M. SARAVANAN, *Assistant Professor*

Mr. A. RAMKUMAR, *Assistant Professor*

Mrs. K. SUVITHA, *Assistant Professor*

Mr. K. SILAMBARASU, *Assistant Professor*

Ms. R. SIVARANJANI, *Assistant Professor*

Ms. P. MEENA, *Assistant Professor*

Mrs. P. SEMBARUTHI, *Assistant Professor*

Department of Chemistry

E.R.K Arts and Science College

E. R. K ARTS AND SCIENCE COLLEGE

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Sir. C.V. RAMAN ASSOCIATION
DEPARTMENT OF PHYSICS AND CHEMISTRY
In Association with
INDIAN SCIENCE AND TECHNOLOGY ASSOCIATION
&
ELAVENIL ORGANIZATION, Chennai, Tamilnadu, India.
Organizes
TWO DAY INTERNATIONAL CONFERENCE
On

RECENT APPLICATIONS IN ADVANCED MATERIALS

IC-RAAM 2019

On 11th and 12th July - 2019 at 10.00 am in Our College Premises

PROGRAMME SCHEDULE

11.07.2019 THURSDAY		
9.00 am – 10.00 am	**Registration!**	
INAUGURAL FUNCTION		
INVOCATION!		
10.00 am – 10.30 am	**Lightening of the Holy Lamp!**	
	Welcome Address	**Mr. V. ARUN,** Organizing Secretary – **IC-RAAM 2019,** Assistant Professor and Head, Department of Physics, E.R.K Arts & Science College.
	Honoring the Chief Guest!	
	Scope of the Workshop	**Mr. M. SIVAKUMAR,** Convener– **IC-RAAM 2019,** Assistant Professor & Head, Department of Chemistry, E.R.K Arts & Science College.
	About the Elavenil	**Dr. M. SRINIVASAN,** Director, **ISTA-Elavenil,** Chennai, Tamil Nadu, India
	About the ISTA	**Dr. K. GUNASEKARAN** President, **ISTA-Elavenil,** Assistant Professor, Department of Crystallography & Bio Physics University of Madras, Chennai, Tamil Nadu, India
	Presidential Address	**Dr. D. SAKTHI,** Patron– **IC-RAAM 2019,** Principal, E.R.K Arts & Science College.
	Special Address	**Mr. E. R. SELVARAJ,** Chief Patron– **IC-RAAM 2019** Correspondent, E.R.K Educational Institutions
	Inaugural Address	**Dr. P. RAMASAMY** Former Vice Chancellor, Alagappa University, Karaikudi , Director, SSN Research Centre, Chennai, Tamil Nadu, India.
	Felicitation Address	**Dr. S. GUNASEKARAN** Former Registrar, Periyar University, Salem, Dean, St. Peter's University, Chennai, Tamil Nadu, India
	Vote of Thanks	**Dr. N. KANNADASAN** Organizing Committee member– **IC-RAAM 2019,** Assistant Professor, Department of Physics, E.R.K Arts & Science College.

SPECIAL INVITIES

10.30 am – 11.30 am	**Key Note Address - I**	**Dr. S. GUNASEKARAN,** Former Registrar, Periyar University, Salem, Dean, St. Peter's University, Chennai, Tamil Nadu, India.
11.30 am – 11.45 am	**TEA BREAK!!!**	
11.45 am – 12.30 pm	**Invited Talk - I**	**Dr. K. GUNASEKARAN,** President, **ISTA-Elavenil,** Assistant Professor, Department of Crystallography and Bio Physics, University of Madras, Chennai, Tamil Nadu, India.
12.30 pm – 1.15 pm	**Invited Talk - II**	**Dr. S. SUDHAKAR,** Scientist, Central Electrochemical Research Institute, Karaikudi, Tamil Nadu, India
1.15 pm – 2.00 pm	**LUNCH BREAK! & POSTER PRESENTATION !**	
2.00 pm – 2.45 pm	**Invited Talk - III**	**Dr. M. SELVAPANDIAN,** Associate Professor and Head, Department of Physics, Periyar University PG Extension Centre, Dharmapuri, Tamil Nadu, India.
2.45 pm – 3.30 pm	**Invited Talk - IV**	**Dr. P. BALAJI BHARGAV,** Research Scientist, SSN Research Centre, Chennai, Tamil Nadu, India.
3.30 pm – 4.00 pm	**ORAL PRESENTATION!**	
12.07.2019 FRIDAY		
10.00 am – 11.00 am	**Key Note Address - II**	**Dr. A. SUBRAMANIYA,** Associate Professor, Centre for Nano Sciences and Technology, Pondichery University, Pducherry, India.
11.00 am – 11.45 pm	**Invited Talk – V**	**Dr. T. M. SRIDHAR,** Assistant Professor and Head (i/C), Department of Analytical Chemistry, University of Madras, Chennai, Tamil Nadu, India.
11.45 am – 12.00 pm	**TEA BREAK!!!**	
12.00 pm – 12.40 pm	**Invited Talk - VI**	**Dr. P. VIJAYAN,** University of KwaZula-Natal, South Africa.
12.40 pm – 1.20 pm	**Invited Talk - VII**	**Dr. M. SENTHILPANDIAN,** Research Scientist, SSN Research Centre, Chennai, Tamil Nadu, India.
1.20 pm – 2.00 pm	**LUNCH BREAK!!!**	
2.00 pm – 2.40 pm	**Invited Talk - VIII**	**Dr. J. KALYANA SUNDAR,** Assistant Professor, Department of Physics, Periyar University, Salem, Tamil Nadu, India.
2.40 pm – 3.20 pm	**Invited Talk - IX**	**Dr. M. SRINIVASAN,** Director, ISTA-Elavenil, Chennai, Tamil Nadu, India.

VALEDICTORY FUNCTION

3.20 pm – 4.00 pm	**Welcome Address**	**Mr. N. SIVA,** Organizing Committee member– **IC-RAAM 2019,** Assistant Professor, Department of Physics, E.R.K Arts & Science College.
	Conference Highlights	**Dr. A. SUBRAMANIYA,** Associate Professor, Centre for Nano Sciences and Technology, Pondichery University, Pducherry, India .
		Dr. T. M. SRIDHAR, Assistant Professor and Head (i/C), Department of Analytical Chemistry, University of Madras, Chennai, Tamil Nadu, India.
		Dr. P. VIJAYAN University of KwaZula-Natal South Africa
		Dr. M. SENTHILPANDIAN, Research Scientist, SSN Research Centre, Chennai, Tamil Nadu, India.
		Dr. M. SELVAPANDIAN, Associate Professor and Head, Department of Physics, Periyar University PG Extension Centre, Dharmapuri, Tamil Nadu, India.
		Dr. J. KALYANA SUNDAR, Assistant Professor, Department of Physics, Periyar University, Salem, Tamil Nadu, India.
		Dr. M. SRINIVASAN, Director, ISTA-Elavenil, Chennai, Tamil Nadu, India.
	Special Address	**Dr. D. SAKTHI,** Patron– **IC-RAAM 2019,** Principal, E.R.K Arts & Science College.
	Valedictory Address	**Dr. K. GUNASEKARAN,** President, **ISTA-Elavenil,** Assistant Professor, Department of Crystallography and Bio Physics , University of Madras, Chennai, Tamil Nadu, India.
	CERTIFICATE DISTRIBUTION & BEST PAPER AWARD!	
	Vote of Thanks	**Dr. S. SIVAKUMAR,** Organizing Committee member– **IC-RAAM 2019,** Assistant Professor, Department of Chemistry, E.R.K Arts & Science College.
NATIONAL ANTHEM!!!		

International Conference on
RECENT APPLICATIONS IN ADVANCED MATERIALS
(IC-RAAM 2019)

11th and 12th July, 2019

Organized by

Sir CV Raman Association

Department of Physics & Chemistry

E.R.K Arts and Science College, Erumiyampatti

(Affiliated to Periyar University, Salem and Recognized Under Section 2(f) & 12(B) of the UGC Act, 1956)

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E.R.K Arts & Science College established in 2008 by E.R.K Educational Trust, is committed to provide quality education to the women folk of Dharmapuri and neighboring districts. It is affiliated to Periyar University, Salem and recognized under section 2(f) & 12(B) of the UGC Act, 1956. The college is aimed at empowering the women to become economically independent, morally strong and above all socially concerned to the task of building a strong nation.

This Temple of Knowledge is located at Erumiyampatti sprawled along the Salem- Chennai National Highway in a green and serene atmosphere very closer to Harur town and Morappur Railway station. The whole campus is eco-friendly and conducive for effective teaching-learning process. The edifice of the college has sophisticated infrastructure supporting all academic oriented activities. The college gives much more priority to Tradition, Culture and Social Values along with Education. The students are trained in Yoga, Classical dance, Violin, Beautician, Tailoring and Soft skill to develop their overall personality thus enabling them to face life challenges in the competitive global scenario. The college offers 13 UG courses, 8 PG courses, 7 M.Phil & 3 Ph.D., research programmes.

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About the Conference

Material Science play's a vital role in all the sectors of the economy. It offers a bright future for the innovative and growth oriented students. Due to increasing demand for the researches, it has become the most preferred career option all over the world. Material Science can be applied in various sectors such as in DSSC, Photo catalytic, Biosensors, and Dielectrics like that. This seminar will helps to know the recent applications and some research methods in the Advanced Materials.

We are glad to inform you that eminent scientist from various spheres are going to deliver key note lectures on glimpses of future prospects of Advanced Materials. We hope that this conference will offer a platform for students to interact with scientists and provide an opportunity to get exposure to the latest development in the field of material science.

Focused Area

- Nano Materials
- Crystallography
- Photo Catalytic
- Photo Voltaic
- Crystal Growth
- Bio Sensors
- Green Chemistry
- Spectroscopy
- Thin film
- Density Functional Theory

Abstract

The researchers are requested to mail their abstracts in word format to icraam2019@gmail.com. The Abstract is limited to one page including figures, tables and references. The title of the paper should be in Times New Roman with the font size of 14 and the rest of the text in 12 font size with 1.5 line spacing. The selected abstracts will be allowed for poster/oral presentations. The selected full paper will be published in the "Science and Technological Research Journal" after peer reviewing process. All the Registered Participants abstracts will be published in the Proceedings with ISBN.

Important Dates

Abstract Submission	: 30.06.2019
Acceptance Notification	: 02.07.2019
Registration Deadline	: 05.07.2019

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Accommodation

Separate accommodation for gents and ladies will be provided on payment basis with preior intimation.

CONTACT

Address for Communication:
Mr. M. Sivakumar
Convener & Head, Department of Chemistry
Phone No.: +91 99434 72183
and
Mr. V. Arun
Organizing Secretary & Head, Department of Physics
Phone No.: +91 99657 48374
E.R.K Arts and Science College
Erumiyampatti – 636 905, Dharmapuri
Tamil Nadu, India
E-Mail: icraam2019@gmail.com

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ABSTRACTS OF INVITED TALKS

Dr. S. Gunasekaran, Ph.D., D.Sc.
TANSA Awardee
Dean, Research & Development
St. Peter's Institute of Higher Education and Research,
Avadi, Chennai – 600 054.
Former Registrar, Periyar University, Salem.
Former Head, Department of Physics, Pachaiyappa's College, Chennai – 600 030.
Founder President, Indian Spectrophysics Association
E-mail: deanresearchspu@gmail.com

ATR TECHNIQUE – A FORTUNE TO FTIR SPECTROSCOPY FOR MATERIALS CHARACTERIZATION

Abstract

Spectroscopy is a major tool in analyzing many physical, chemical and biological phenomena and it is being used widely in various laboratories. Mid-Infrared (IR) spectroscopy is an extremely reliable and well recognized fingerprinting method. Many substances can be characterized, identified and also quantified. The technique of Attenuated Total Reflectance (ATR) has in recent years revolutionized solid and liquid sample analyses because it combats the most challenging aspects of infrared analyses, namely sample preparation and spectral reproducibility. Overall, sample preparation is easier for liquid transmission studies when compare to solid transmission sampling but both suffer from inevitable reproducibility issues given the complexity of the sample preparation methods. In addition, preparation can be very messy and time consuming and is further complicated by difficulties is getting sample to matrix ratios correct and homogenous throughout the sample. The materials involved are fragile and hydroscopic and the quality of measurements can be adversely affected if handled or stored incorrectly. The technique of Attenuated Total Reflectance addresses these issues.

An attenuated total reflection accessory operates by measuring the changes that occur in a totally internally reflected infrared beam when the beam comes into contact with a sample. An infrared beam is directed onto an optically dense crystal with a high refractive index at certain angle. This internal reflectance creates an evanescent wave that extends beyond the surface of the crystal into the sample held in contact with the crystal. It can be easier to think of this evanescent wave as a bubble of infrared that sits on the surface of the crystal. This evanescent wave protrudes only a few microns (0.5 μ - 5 μ) beyond the crystal surface and into the sample. Consequently, there must be good contact between the sample and the crystal surface. In regions of the infrared spectrum where the sample absorbs energy, the evanescent wave will be attenuated or altered. The attenuated energy from each evanescent wave is passed back to the IR beam, which then exits the opposite end of the crystal and is passed to the detector in the IR spectrometer. The system then generates an infrared spectrum.

ATR spectroscopy is a dynamic technique for materials characterization. But the better utilization of science gives an opportunity to use FTIR – ATR in the advanced materials characterization. The sensitivity of Fourth Derivative FTIR ATR spectroscopy is well understood with the bulk fill composites used in dentistry and the Nanocellulosic Fibrils extracted from Natural fibres. The changes in crystallinity of the fill composites and Nanocellulose are manipulated with the internal absorption ratio in the zeroth order FTIR-ATR spectra, whereas, the spectral difference is visibly highlighted in the Fourth Derivative FTIR-ATR spectra. It is also employed for early diagnosis and monitoring the status of diseases. The average and Difference FTIR spectra are also obtained and deployed for materials characterization. This shows that the materials characterization technique also grows along with the exploration of Modern materials.

XRD: THE WAY FOR STRUCTURAL UNDERSTANDING IN TURN THE BACKBONE OF ANALYTICAL SCIENCE

K. Gunasekaran

CAS in Crystallography and Biophysics, University of Madras, Guindy Campus, Chennai – 25,

E-Mail: gunaunom@gmail.com

Physics, being so natural have given much more to this work through science. The governing laws are established for better understanding of nature and its course which later exploited to realize new applications. List of applications is growing day by day because of increasing computing power. Better and comfortable living is achieved as the consequence of these developments. The moment we realized that molecules are important players in every process either living or non-living, we also realized that the structure of the molecule(s) is the actual factor for such process. When structure of the compound/molecule/material is disturbed, we could witness the loss of activity which makes them useless. That makes structure analysis essential for better understanding about the material. When such structure-activity correlation is established, obviously, it becomes easy to design/optimize the structure for a defined application.

To determine the structure, many different physical phenomena were employed and Crystallography is realized a s the only tool to arrive at the 3D of any molecule/compound. Equal to discovery of X-rays, Bragg's law which explains the condition for diffraction maxima revolutionized the crystal physics. Using Bragg's law basically we can "slice" a crystal to "see" the content inside. As the outcome, the 3D structure of the molecule present inside the crystal could be determined. Also from "structure-activity" relationship, further structural engineering efforts could make new molecules with desired function. When the 3D structure is known, by incorporation of many physical aspects, modern computing methods could calculate inter atomic aspects with high accuracy. X-ray crystallography is the most comprehensive technique available to determine the molecular structure with no prior information. In addition to these, crystallographic results are self verified by which the quality of the arrived structure can be authenticated with several parameters. In the presentation, basis for structure determination through crystallography will be elaborated.

Li-ion Batteries: Safe Handling Practices

S. Sudhakar

Scientist, CSIR-Central Electrochemical Research Institute (CECRI), Karaikudi, 630003, India.

E-Mail: *ssudhakar79@gmail.com*

Li-ion batteries are the powerhouse for today's electronic revolution in this modern mobile society, exclusively used in mobile phones and laptop computers. The success of commercial Li-ion batteries in the 1990s was not an overnight achievement, but a result of intensive research and contribution by many great scientists and engineers. Then much efforts have been put to further improve the performance of Li-ion batteries (LIBs), achieved certain significant progress. To meet the increasing demand for energy storage, particularly from increasingly popular electric vehicles, intensified research is required to develop next-generation Li-ion batteries with dramatically improved performances, including improved energy density, cyclability, charging rate, stability, and safety.

As the energy density of batteries increases, battery safety becomes even more critical if the energy is released unintentionally. Nowadays accidents related to fires and explosions of LIBs occur frequently worldwide which have caused serious threats to human life and health and have led to numerous product recalls by manufacturers. Therefore safe handling of LIBs is of equally or much more important as that of the manufacturing considerations. This presentation particularly aims on the awareness on the safe handling of LIBs and the disposal practices of batteries.

ROLE OF ELECTROLYTE IN LITHIUM ION BATTERY

M.Selvapandiyan

Department of Physics, Periyar University PG Extension Centre, Dharmapuri-636-701, Tamil Nadu, India.

E - Mail: mselvapandiyan@rediffmail.com

Rechargeable lithium based batteries have been widely investigated as the light weight and high energy density energy storage devices. Due to good conductivity, high thermal stability, high electrochemical window range and low cost, the electrolyte materials play vital role in Li-ion battery applications such as memory backup, real time clock, cell phones, laptop computers and ect. Cycling stability and charging capability of the lithium ion battery was improved by using lithium complex electrolytes. Lithium complex electrolyte, especially $LiPF_6$ and the combinations of $LiPF_6$ and $LiB(C_2O_4)_2$ may be solved many problems in high power Lithium ion battery and specifically improved their reliability, lifetime, safety, operation in a wide temperature range and a acceptable cost correlate with those of presently used electrolyte systems. Thermal stability of self synthesized lithium hexafluro phosphate was analyzed by thermo gravimetric and differential thermal analysis which shows that the thermal stability higher than the reported values. Powder X- ray diffraction studies confirm that $LiPF_6$ material belongs to hexagonal system and space group is Oh. Structure and thickness of the material was investigated by Atomic force microscope.

1D-Nanostructured Materials for Dye Sensitized Solar Cells

A.Subramania

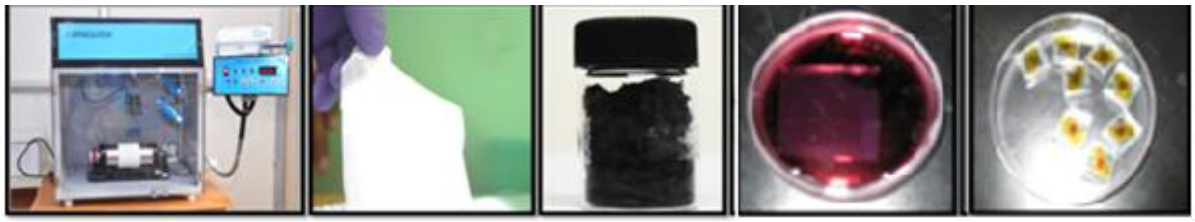
Centre for Nanoscience and Technology,

Pondicherry University, Puducherry - 605 014, India.

E-mail: a.subramania@gmail.com

ABSTRACT

Electrospun 1D-Nanostructured materials have high reactive surface area with interconnected porous morphology which enable to have significant attention in recent years and are considered as promising candidate for many hi-tech applications, particularly energy conversion and storage devices. These 1D- Nanomaterials can be prepared by a simple and versatile electrospinning technique. This presentation will focus on working principle of electrospinning and the influence of variable parameters such as electric potential, flow rate, polymer concentration, distance between the needle and target screen, temperature, humidity and motion of the target screen on the formation of electrospun 1D- Nanofibrous materials. Further, special attention will be focused on the development of electrospun 1D-TiO_2 based photoanodes, CNFs based counter electrodes and Nanofibrous polymer electrolyte membrane for dye sensitized solar cell (DSSC). These 1D- Nanostructured materials have very good photovoltaic performance than the same obtained by other conventional techniques.



Nano Materials for Gas Sensor Application

T.M. Sridhar[1]and R. SasiKumar[2]

[1]Department of Analytical Chemistry, University of Madras, Chennai- 600025, India.

[22]Department of Physical Chemistry, University of Madras, Chennai-600025, India.

[1]Corresponding author: tmsridhar@gmail.com

Nanomaterials are particles in nanometer scale dimensions. Their size ranges from approximately 1-100 nanometers and they possess unique chemical and physical properties. The physical and chemical properties of nanomaterials depend on shape, size and surface properties. The shape, size and surface properties ofnanomaterials can be controlled by various techniques and surface modification is most promineintly used.Nanoscale materials offer several advantages over bulk in reverence of high surface to volume ratio and hence suggest their applicationsin vast areas such as solar systems, catalysis, electronics, gas sensors, and biosensor,etc.

H_2S gas is very toxic and naturally produced by the degradation of organic waste by bacteria. H_2S is often used in several industries and chemical laboratories. It is also utilized in heavy water plants as a process gas. Long exposures (10ppm for 8hrs) might give serious side effects including death. Hence, to develop a suitable rapid detection of H_2S device at room temperature condition is still highly demanded.

Nano metal oxide based sensors have been used to monitor toxic gasses, because these materials possess unique electronic properties, chemical and thermal stabilities, low power consumption, low weight and are highly compatible with the process. Until now ZnO, In_2O_3, TiO_2, SnO_2, CeO_2, WO_3, Fe_2O_3, and CuO, etc., nanostructures have been developed for monitoring H_2S. It was found that by doping the surface morphology changes played a significant role in gas sensing performance. These types of sensor have been utilized to target environmental polluting gasses. Several research articles published by various research groups have been reported over the years on nanomaterial-based gas sensors. But still, there is a challenge to overcome some of the fundamental principles such as repeatability, selectivity, and stability under harsh environmental conditions. On the other hand, solid state electrochemical based gas sensors are used for detecting toxic gases show excellent stability under harsh environmental conditions. Solid state electrochemical gas sensors can be used to detect toxic gas at trace levels.

Evaluating Ligand Architectural Features in Organometallic Ruthenium(II) Complexes: Influence on Structure and Catalysis

Paranthaman Vijayan

School of Chemistry and physics, University of KwaZulu-Natal, Pietermaritzburg Campus, Private Bag X01 Scottsville, 3209, South Africa.

Abstract

A series of ruthenium(II) complexes bearing pyridine/pyrazine-carboxamide ligands, $HL^{BT/BI}$ and $HL^{pybt/pybi}$ (HL^{BT} = N-(benzo[d]thiazol-2-yl)picolinamide and HL^{BI} = N-(1H-benzo[d]imidazol-2-yl) picolinamide, HL^{pybt} - N-(benzo[d]thiazol-2-yl)pyrazine-2-carboxamide; HL^{pybi} - N-(1H-benzo[d]imidazol-2-yl) pyrazine-2-carboxamide) have been synthesized. All Ru(II) complexes have been characterized by using various spectroscopic techniques (FTIR, UV-Visible, ^{1}H, ^{13}C, ^{31}P-NMR and ESI-MS), conductivity and elemental analyses. The solid-state structures of all Ru(II) complexes were substantiated by the single crystal X-ray diffraction technique that revealed versatile coordination modes of two bidentate ligands varying between N-N and N-O modes. All Ru(II) complexes exhibited a distorted octahedral geometry with a bidentate ligand while other coordination sites are occupied by either anionic Cl^{-}or neutral co-ligands (CO, PPh_3, CH_3CN or $(CH_3)_2SO$). These well-defined ruthenium(II) complexes have been utilized as the homogeneous catalysts for the alkylation of amines using alcohols ensuing hydrogen borrowing strategy. The synthesized ruthenium(II) complexes were found highly active catalysts towards the N-alkylation of different amines with assorted alcohols and transfer hydrogenation of ketones. The organic products were obtained in excellent yields with good tolerance to a large variety of functional groups. To evaluate the role of putative Ru-hydride species as the intermediate during the catalytic cycle, the respective Ru-H complexes were synthesized by the reaction of Ru-Cl complexes with $NaBH_4$. Both Ru-H complexes were characterized using different spectroscopic techniques and crystallography. Importantly, both Ru-H complexes were directly able to alkylate imine using alcohol thus confirming the involvement of Ru-hydride species as the intermediates during the proposed catalytic cycle.

DEVELOPMENT OF HIGH QUALITY 4-NITROPHNOL DERIVATIVE NONLINEAR OPTICAL (NLO) SINGLE CRYSTALS: A NOVEL ROTATIONAL UNIDIRECTIONAL METHOD

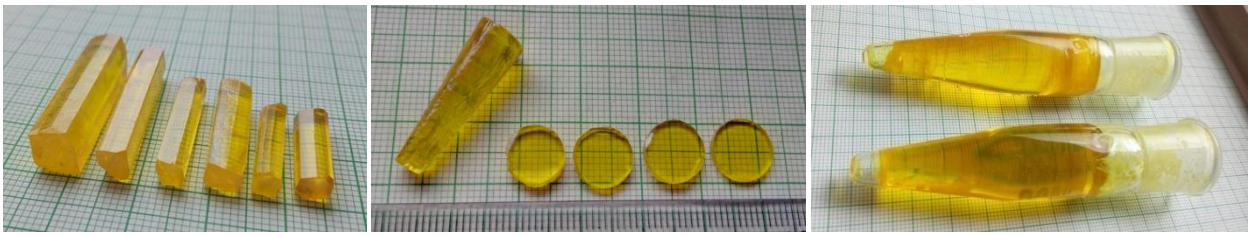
Muthu Senthil Pandian*, P. Ramasamy

SSN Research Centre, SSN Institutions, Chennai-603110, Tamilnadu

***E-mail: senthilpandianm@ssn.edu.in**

Gravity driven concentration gradient is used in the uniaxially solution-crystallization method of Sankaranarayanan-Ramasamy (SR). TGS, GPI, KAP, SSDH, DGZCD, DGBCM, benzophenone and many more crystals have been successfully grown by SR method. Longest benzophenone crystal having dimension of 1350 mm length and 55 mm diameter was grown for the first time in solution growth by SR method. Starting with a thin plate as seed a large size crystal can be grown. The physical properties and crystalline perfection of the SR method grown crystal is normally superior to the conventional method grown crystals. The quality of the SR method grown crystals has been improved by several modifications made in SR method. The impurity segregation cannot be avoided in the existing SR method. So we planned to introduce the RSR method for growing good quality, unidirectional single crystals. The effect of rotation on unidirectional crystal growth method (Rotational Sankaranarayanan - Ramasamy (RSR)) has been proposed for the first time. The organic nonlinear optical 2-Aminopyridinium 4-nitrophenolate 4-nitrophenol (2APNP) crystals have been grown by (i) conventional slow evaporation, (ii) Sankaranarayanan-Ramasamy (SR) method and Rotational SR (RSR) method. The grown 2APNP crystals were subjected to various studies like HRXRD, laser damage threshold, chemical etching, Vickers microhardness, birefringence, UV-Vis NIR, dielectrics and piezoelectrics. The Rotational Sankaranarayanan-Ramasamy (RSR) method grown crystals show excellent optical, mechanical, dielectric and piezoelectric behavior and higher laser damage threshold capability compared to the conventional and normal SR method grown crystals. HRXRD and etching studies showed that the quality of the RSR method grown crystal is better than conventional and normal SR method grown crystal. The Rotational Sankaranarayanan-Ramasamy (RSR) method can be used to grow single crystals along a specific crystallographic direction such as the phase matching direction in nonlinear optical (NLO)

crystals. The unidirectional crystal growth method is ideally suited for crystal growth along this direction to obtain large size crystals required for obtaining SHG elements with minimum wastage. In addition, the unidirectional solution crystallization usually occurs at around room temperature; much lower thermal stress is expected in these crystals over those grown at high temperatures. Successful development of this unidirectional method will provide the technology to produce crystals at a yield close to 100% and easy scaling-up process.



2AP4N crystals grown by (a) Conventional method, (b) SR method and (c) RSR method

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Thin film Technology- Role in Photovoltaics

P.Balaji Bhargav

SSN Research Centre, Kalavakkam, Tamilnadu 603110

Email: balajibhargavp@ssn.edu.in

Thin Film Solar Cells (TFSCs) occupies a special space in PV cell/module technology. In short to medium term it is most useful for some off- grid niche applications like (1) Building Integrated Photovoltaic (2) light weight and flexible power sources (3) space applications (4) various other off grid applications including LED based solar lanterns and other small power applications. In long term when production reaches terawatt range (annually) the material requirement will be a key factor where TFSCs will play very significant role. In medium and long term range silicon based TFSCs like a-Si, Micromorph and their upgraded versions will play very important role as the stabilized efficiency is expected to exceed 12%and the material and production cost will be very low so that it will compete with c-Si cells even for power applications. Future projections for PV module technology includes flexible thin film solar modules, thin c-Si modules and HIT cell modules which will dominate the world market. Among these, flexible solar cells are a promising new breed of solar devices. To reduceprocessing and manufacturing cost, roll-to-roll processing approach must be adopted, because of less floor-space requirement for production equipments and allows a higher throughput. The main benefit of these types of cells lies in their portability. They can be rolled-up and stored easily so that transporting them is simple and convenient. Tandem solar cells, a combination of a-Si and µc-Si layers designated as "micromorph solar cells", represent a promising way of overcoming the efficiency limits of single-junction solar cells and reducing the light-induced degradation related to amorphous silicon thin film solar cells. Flexible thin film silicon solar cells are generally fabricated in substrate/n-i-p configuration. For improved efficiencies, variouslight trapping schemes by incorporating different surface structuresare in use. The advantage of micromorph approach is that it keeps the thickness of the top amorphous silicon layer low, which in turn reduces the effect of initial light induced degradation of photocurrent (Staebler-Wronski effect). Thin film solar cells in single junction and tandem structures on flexible substrates are fabricated using roll to roll process by industries with reported efficiencies around 9% and 12%, respectively. Still efforts are being made to improve the efficiency of the solar cells by incorporating novel materials with better light trapping techniques.

SENSING AND GAS STORAGE APPLICATION OF THE NOVEL BIO-MOFS

Dr. J. KALYANA SUNDAR

ABSTRACT

The metal-organic framework (MOF) research activities can be classified into MOF preparation, MOF processing and MOF application. Processing MOFs into specially ordered shapes and morphologies is of great importance, since it bridges MOFs to real-life applications.

Many of the potential applications, MOFs are required to made of biological building blocks for environmentally compatible. Also, the commercialization of MOFs will require bulk quantities. So, reduce their environmental impact, large scale MOF materials should be either environmentally compatible or easy to recyclable. Recants years, MOFs should bestructured according to specific conditions that address their environmental and biological compatibility.

Nowadays, naturally obtained organic linkers based building block are emerged class of framework denoted biomolecule based metal-organic frameworks MOFs constructed from atleast one biomoleculewhich acts as a linker, which denoted as Bio-MOFs. Biological molecules interact with metal ions or clusters with exquisite precision and (stereo)chemical selectivity to produce the structurally diverse materials. Bio-MOFsfunctional nature high depended on the bio-linkers behavior; it's definedrigid or flexible structural nature also.

Especially amino acid as building blocks can introduce novel properties besides the inherent features of MOFs, thus opening a door to enhancing their performance in various applications. This talk is focused on the fabrication of bio-MOFs, one dimensional to three-dimensional MOF architectures via various concepts inspired by polymerization and interfacial techniques. The Functional properties of synthesized compounds were investigated and confirmed the gas sorption, sensor and photo luminescence properties.

Theoretical and Experimental investigation on mc-Si growth process

M. Srinivasan and P. Ramasamy

SSN Research Centre, SSN Institutions, Chennai-603110.

*Email : srinivasanm@ssn.edu.in

Among all the renewable energy sources, PV solar cell plays a main role. Single crystal and multi- crystalline solar cells are considered as first generation solar cells. Thin film based solar cells (a-Si, micromorph, CdTe/CdS and CIGS) are considered as second generation solar cells. Nano-crystalline based dye-sensitized solar cells (DSSCs), polymer-based solar cells and concentrated solar cells are considered as third generation solar cells. There is lot of crystal growth in several of these solar cells.

We have been working on the following three type of solar cells which involves plenty of crystal growth:

1. mc-Si by DS method.
2. TiO_2 nano-crystals for DSSCs
3. Micromorph& Nano-wire based a-Si solar cells by PECVD.

The majority of PV solar cells are fabricated from bulk silicon crystals, which may be either single-crystalline or multi-crystalline. A market share ofmono- and multi-crystalline silicon (mc-Si) are more than 90% at present and will be so in the foreseeable future. Single-crystalline wafers typically have better material parameters but are also more expensive which are grown by Czochralski (Cz) growth process. CZ wafers contain a large amount of oxygen in the silicon wafer. Oxygen impurities reduce the minority carrier lifetime in the solar cell, thus reducing the voltage, current and efficiency. In addition, the oxygen and complexes of the oxygen with other elements may become active at higher temperatures, making the wafers sensitive to high temperature processing. To overcome these problems, Float Zone (FZ) wafers may be used. Due to the difficulty in growing large diameter ingots and the often higher cost, FZ wafers are typically only used for laboratory cells and are less common in commercial production. Multi-crystalline silicon (mc-Si) is an important material with advantages of low-production cost and high conversion efficiency. It has a market share of more than 60% in all photovoltaic materials. Directional solidification (DS) method has become the leading technique for producing mc-Si because of its better feedstock tolerance, higher throughput and easier operation.Solar cell efficiency is decreased by impurities, precipitates, and structural defects in the mc-Si ingots. The generation and distribution of

these are investigated using numerical analyses in this paper. Simulation of heat and mass transfer in bulk growth has become an indispensable tool for an efficient, time and cost saving optimization procedure. A global modelling of heat transfer was performed to study the generation of creep stress and formation of dislocations in multi-crystalline silicon at the various growth stages for the various modified DS systems. The aim is to increase average grain size in silicon multi-crystals and reduce the impurities distribution and dislocation density.

ABSTRACTS OF CONTRIBUTED PAPERS

The Structural, Electrical and Optical Properties of BiFO Doped Sodium Potassium Niobate Lead Free ceramics

A.Rashid*

Advanced Functional Materials Laboratory, Department of Physics, National Institute of Technology, Tiruchirappalli-620 015, Tamilnadu, India

Abstract

Presently, the most promising family of lead-free piezoelectric ceramics is based on $K_{0.5}Na_{0.5}NbO_3$ (KNN). To improve the properties of KNN various substitutions have been performed. In the present study BFO modified $(KNaNbO_3)_{1-x}BFO$ (x = 0.01 to 0.09) piezoelectric ceramics have been synthesized by the conventional solid state processing technique sintered at 1080^oC-1200°C, thereby enhancing the electric and optical properties. Samples exhibit single phase perovskite orthorhombic structure at x=0.01 and transform torhombohedral it is studied through X-ray diffraction analysis. Raman spectra in the range of 100–1000 cm^{-1} at room temperature confirm the result. Suppression, broadening, and shifting of Raman modes have been observed with further increase in BFO concentration. The dielectric properties of the ceramics have been investigated in broad frequency (from 100 Hz to 1 GHz) and temperature (from 30 to 500°C). The dielectric plots show two diffused phase transitions. The addition of BFO also lead to a decrease in both the Curie temperature (T_C) and the first order phase transition temperature (T_{T-O}) of the ceramics. The optical properties within the given composition range have been found to be amazing result.

Presenting author:

E-mail: *rasvellamunda@gmail.com*

Tel: *(+91) 9645306605*

Electrochemical behavior of room temperature ferromagnetic NiO nanoparticles: an electrode material for Supercapacitors

G.Bharathy[1*], P.Raji[2], M.Shanthi[1], M.Hema[1]

[1]*Department of Physics, Kamaraj College of Engineering & Technology, Virudhunagar-625701, India*

[2]*Department of Physics, Mepco Schlenk Engineering College, Sivakasi - 626005, India*

Abstract

The renewable energy resources are essential to resolve the energy crisis problems in the World. Storing of this energy is more important for future generations. Super capacitors are superior to conventional capacitors having higher energy density and charge-discharge rates and longer life time. NiO is a suitable material for super capacitors due to its high specific capacitance value and stability. NiO nanoparticles for various calcinations temperatures (0 ºC, 400 ºC, 600 ºC, 800 ºC) have been synthesized using sol - gel method. The structure and morphology of the sample are analyzed using X-ray Diffractometer, SEM with EDX. From the XRD analysis, it was observed that the sample can have FCC structure with crystallite size around 22 nm. Functional group analysis was carried out using Fourier transform infrared spectroscopy (FTIR). Photoluminescence (PL) emission spectra show blue emission with a strong band at 345nm. SEM & TEM images confirm the spherical morphology and high crystalline nature of the samples. EDX spectrum shows the purity of the samples. The magnetic properties of the samples are analyzed using Vibrating sample magnetometer (VSM) and high saturation magnetization achieved for NiO samples without calcinations. All the samples shows room temperature ferromagnetism and higher saturation magnetization achieved in 0.3%Mg doped samples. The electrochemical measurement was carried out on a biologic SP-150 with three electrode cell in 1M KOH electrolyte solution at room temperature. The cyclic voltammetric curves show the oxidation and reduction peaks. The specific capacitance value is calculated and it is maximum for 800ºC calcined sample. A result reveals that NiO nanoparticles are suitable electrode materials for super capacitors.

Keywords: *NiO naoparticles, Sol-gel synthesis, Supercapacitor, Ferromagnetism*

Presenting author:

E-mail: *bharathyv.rajann@gmail.com*

Structural and Electrical properties $CaMnO_3$ prepared by sol-gel method

Nandan K. R[1]*, Ruban Kumar A[2], Kiran K.S[1], Maruthi N[1] and Prasanna B.P[1]

[1]*Department of Physics, School of Engineering and Technology, Jain Deemed to be university, Bangalore*

[2]*Centre for Crystal Growth, School of Advanced Sciences, VIT University, Vellore-632 014, India*

Abstract

The structural and electrical properties of $CaMnO_3$ prepared by a sol-gel technique using citric acid as a chelating agent at 800^0c were studied; the phase formation was determined by powder XRD. The surface morphological studies were carried out through SEM and EDX confirmed the chemical compositions of the sample. The electrical properties of the prepared samples were analyzed at different temperatures in the frequency ranges from 50 Hz to 5 MHz.

Keywords: *Sol-gel, dielectric properties and impedance Spectroscopy*

Presenting author:

E-mail: *nandan88.kr@gmail.com*

Influence of nanofiller $BaTiO_3$in composite polymer electrolyte based on polyvinylidene chloride-co-acrylonitrile

M. Shanthi*, G. Bharathy, M. Hema,

Department of Physics, Kamaraj College of Engineering and Technology, Madurai-625 701, Tamilnadu

Abstract

The tremendous increase in the electronic gadgets like cellphone, laptop, ipod need for high energy density battery. Polymer electrolytes are promising candidate to meet such energy demand. Several strategies are followed to enhance the ionic conductivity. One among them is addition of nano filler. In this investigation BaTiO3 has been chosen as nano filler. Nano composite polymer electrolytes based on poly(vinylidence chloride-co-acrylonitrile) encapsulated with dopant lithium tetra flouro borate ($BaTiO_3$), ethylene carbonate (EC) as plasticizer and barium titanate ($BaTiO_3$) as a filler were prepared by solution casting technique. The structural and complex formations of the prepared composite polymer membranes were confirmed by XRD and FTIR. Ionic conductivity studies were carried out by ac impedance analyzer. Addition of nanofiller $BaTiO_3$ enhanced the ionic conductivity. The thermal stability of the prepared electrolytes was examined by DSC. The sample with 6wt% of $BaTiO_3$ exhibited highest ionic conductivity 1.6 $x10^{-3}$ S/cm.

Presenting author:

E-mail: mithrasreelaya@gmail.com

Microbial fuel cells (MFC) using ammonium halide doped proton exchange membranes

M. Hema*, M. Shanthi, G. Bharathy

Department of Physics, Kamaraj College of Engineering and Technology, Madurai-625701, Tamilnadu

Background: Increasing human activities are consuming the natural energy sources leading to depletion of fossil fuels. Active research for finding out alternate sources of energy generation especially from renewable sources is on the way. Nearly all the conventional energy production processes practiced today which requires combustion of polluting fossil fuels are expensive and are not considered to be environmental friendly. MFC offer a potential solution to all these problems, by taking nature's solutions to energy generation.

Objective: To construct a two compartment MFC using PVA doped with ammonium halides. For the first time the conventional NAFION membrane is replaced by our own prepared proton conducting polymer electrolyte membrane.

Methods: Glucose is oxidized anaerobically by *Klebsiella pneumoniae* in the anodic compartment while in the cathodic compartment 100m*l* of phosphate buffer and 100m*l* of potassium ferricyanide (0.1M) have been used. PVA: NH_4X (X=I, Br, C*l*) polymer electrolytes have been prepared using solvent casting technique. The prepared polymer electrolyte with desired size were cut into circular form and sandwiched between the junctions of the anodic and cathodic compartment. Graphite was used as the electrodes in both the compartments. During this experiment, N_2 gases were spurge into the anode compartment and get sealed, in order to maintain anaerobic conditions.

Conclusion: The maximum open circuit voltages of 475mV, 450mV and 406mV have been obtained in MFC using PVA: NH_4I, PVA: NH_4Br, PVA: NH_4Cl polymer electrolytes respectively which are well suited for its practical applications. The discharge characteristic of the constructed cell was discussed.

Presenting author:

E-mail: *hemameetsu@gmail.com*

Effect of doping level on the structural, optical and antibacterial activity of Sn and F doped ZnO nanopowders synthesized by simple soft chemical route

K. Saravanakumar[1*] and R.K. Sankaranarayanan[2]

[1]*Department of Physics, Mahendra Engineering College (Autonomous), Mallasamudram, Namakkal-637503, India.*

[2]*National Centre for Catalysis Research, Department of Chemistry, Indian Institute of Technology, Chennai - 600 036, India.*

Abstract

In the recent decade, theoretical and experimental work in the nano field is the much conspicuous in reporting a material with enhance properties. Zinc oxide (ZnO) is a most versatile metal oxide semiconductor with wide band gap (3.3 eV) and high exciton binding energy of 60 meV. In addition, ZnO nanostructures are promising with many applications such as lithium ion electrode materials, field emission diodes, biological sensors, antibacterial activities and logic circuits. Herein report, Sn+F doped ZnO nanopowders are synthesizes using low-temperature soft chemical method with different Sn+F doping level. The synthesized powders are annealed at 500° C for 12h. The X-ray diffraction studies reveal that the preferential orientation along (101) peak with hexagonal wurtzite structure of ZnO. Crystallite size is decreased from 27 to 19 nm. The SEM and TEM images are performed the morphological and microstructural changes and also the SAED patterns matched with the wurtzite ZnO lattice. From The EDAX spectra of the powders showed that the presence of elements like Zn, Sn, F and O and the optical band gap value is varied from 3.22 to 3.35 eV with respect to Sn+F doping level. The zone of inhibition for the *E.Coli* bacteria is found to be increased with increase in the dopant concentration.

Presenting author:

E-mail: *saravanan.phy@gmail.com*

Experimental and Numerical Realization of Chaotic Phenomena In A Simple 3d New Autonomous Nonlinear Electronic Circuit

G.EDHAYAKALAI*

Department of Physics, Vivekanandha College of Arts and Sciences for Women (Autonomous), Tiruchengode – 637 205

Abstract

The simple third-order chaotic dynamics of a new autonomous oscillator circuit was studied by measuring its responsible in the form of phase-portrait, power spectrum and chaotic time series. The circuit consists of just three linear elements (two capacitors and one inductor), one linear negative conductance and cubic nonlinearity exhibiting the symmetrical piecewise-linear *v-i* characteristics. The power spectrums are presented to confirm the lower dimensions of strong chaotic nature of the oscillations of the circuit. The performance of the circuit is investigated by means of experimental and numerical confirmation of the appropriate differential equations. The features of the obtained results are respected for various engineering system such as chaos communication systems with robustness against various interferences.

Keywords Chaos; simple-3D new autonomous oscillator circuit; Power spectrum; Chaotic time series.

Presenting author:

E-mail: *edhayakalaiganga1127@gmail.com*

Development of Thin Film Capacitors for Power System Applications Bby Pvd Technique

R. Elakkiya*

Department of physics, Vivekanandha college of arts and sciences for women (Autonomous), Elayampalayam, Tiruchengode, Namakkal.

Abstract

Thin film capacitors are very interesting option to electrolytic capacitors, because they are simple compact in structure and effective for fabrication of high frequency devices. Thin film coating capacitors also improved processing characteristics and better dielectric strength. Thin film capacitors for DC filtering in AC/DC converter application. The design of thin film capacitors for high frequency AC/DC converter is implemented using simple simulation tools. The primary research hypothesis is that high frequency capacitance with smaller size can be implemented using physical vapor deposition technique. The thickness of TiO_2 area of metal contact and dielectric properties of TiO_2 are considered as parameters for thin film capacitors development.

Presenting author:

E-mail: *elakkiyaravi10@gmail.com*

Nanotechnology Safety in the Aerospace Industry

V.Nithya[a], S.Kiruthika[b]

[a]*Department of Physics, Vivekanandha College of Arts and Sciences for Women (Autonomous), Elayampalayam, Tiruchengode, Namakkal.*

[b]*Department of Physics, Vivekanandha College of Arts and Sciences for Women (Autonomous), Elayampalayam, Tiruchengode, Namakkal*.

Abstract

Nanomaterials, which take the form of particles, tubes, films, composites, wires, flakes, and fibers, are used for various purposes in the aerospace industry because of their extradinary physiochemical properties. Some nanomaterial can enter the human body via inhalation, ingestion, and skin contact during the fabrication, machining, haulage, and assembly of component, and they can stay in the body for a long period of time. Because nanomaterials are composed of different compounds with various surface areas and energies, they can interact with human tissue, damage or kill cells and organs, block blood flow, and cause grave illnesses. This chapter discuss the application of nanomaterials in the aerospace industry, the health and safty issues related to nanomaterials and the method of protection used against their destructive effect.

Key words: *Nanomaterials, safty, prevention, disease.*

Oxygen partial pressure influenced structural and optical properties of DC reactive magnetron sputtered chromium oxide thin films

B. Gopal Naik* and S. Uthanna

Department of Physics, Sri Venkateswara University, Tirupati-517 502, Andhra Pradesh, India

Abstract

Chromium oxide (Cr_2O_3) thin films attracted much attention because their applications such as solar absorber layers, protective coatings, thermal barrier coatings, anode in lithium ion batteries, and sensing of ethanol and chlorine gases. In this investigation, chromium oxide thin films were deposited on glass substrates held at room temperature by DC reactive magnetron sputtering of metallic chromium target of 50 mm diameter at different oxygen partial pressures in the range $5x10^{-5}$ - $8x10^{-4}$ mbar and at fixed sputter pressure of $3x10^{-2}$ mbar and sputter power of 70 W. The deposited films were characterized for their chemical composition, structure, surface morphology and optical absorption. Thickness of the films decreased from 270 nm to 180 nm with increase of oxygen partial pressure from$5x10^{-5}$ mbar to $8x10^{-4}$ mbar respectively. The deposition rate of the films calculated from the thickness and deposition time of the films decreased from 27 nm/min to 18 nm/min with increase of oxygen partial pressure from$5x10^{-5}$ mbar to $8x10^{-4}$ mbar respectively. High deposition at low oxygen partial pressures < $3x10^{-4}$ mbar was due to presence of unreacted chromium and chromium oxide in the films. As the oxygen partial pressures increased to $4x10^{-4}$ mbar and above were of single phase of Cr_2O_3 as revealed by the energy dispersive X-ray analysis. The thickness of the deposited films decreased from 270 nm to 180 nm with increase of oxygen partial pressure from $5x10^{-5}$ mbar to $8x10^{-4}$ mbar respectively. X-ray diffraction studies indicated that all the deposited films were of amorphous in nature. Scanning electron micrographs revealed that the grown grains were distributed homogeneously on the surface of the films. The optical transmittance of the films in the visible range was low value of 6% at low oxygen partial pressure of $5x10^{-5}$ mbar was due the presence of metallic chromium along with Cr_2O_3. The films formed at oxygen partial pressure of $4x10^{-4}$ mbar exhibited the optical transmittance of 70% due to the single phase of chromium oxide. The optical band of the films determined from the transmittance using Tauc's plots increased from 2.25 eV to 3.05 eV with increase of oxygen partial pressure from $5x10^{-5}$ mbar to $9x10^{-4}$ mbar respectively. From these studies it revealed that single phase amorphous Cr_2O_3 films were achieved at optimum oxygen partial pressure of $4x10^{-4}$ mbar with optical transmittance of 70% and optical band gap of 3.05 eV.

Presenting author:

E-mail: *gopalnaik.sri@gmail.com*

Synthesis and Spectral Elucidation of Mononuclear Schiff base (E)-N'-((E)-((6-methylpyridin-2-yl)imino)(pyridin-4-yl)methyl)benzohydrazonic acid: DNA Cleavage Interaction, Cytotoxicity and Antimicrobial studies

D. Dhivya Priya* and Dr. P. Maheswaran

Department of Chemistry, PGP College of Arts and Science, Namakkal, Tamil Nadu

Abstract

Mononuclear Cu(II), Ni(II) and Co(II) metal complexes of Schiff-base ligand(HL_1) derived from isoniazide, 2-amino-6-methylpyridine and benzoic acid. The synthesized ligand and complexes were structurally characterized by spectral techniques like IR, UV, ^{1}HNMR, cyclic voltammetry, conductance and ESR studies. The measured low molar conductance values in DMSO indicate that the complexes are non-electrolytes. The structures of the solid complexes under study are established by using IR, electronic and ESR spectroscopy suggesting that Cu (II), Co (II) and Ni (II) complexes are octahedral. The ESR spectrum of the Cu(II) complex in DMSO was recorded and its salient features are reported, it supports the mononuclear structure. The synthesized ligands, in comparison to their metal complexes were screened for their antimicrobial activity against bacterial species like (Bacillus subtilis and Salmonella typhi) and fungal strains (Aspergillus niger and Candida albicans). The activity data show that the metal complexes are more potent antibacterial than the parent organic ligands against one or more bacterial species. DNA cleavage ability of the synthesized mononuclear Schiff base metal complexes were also performed by gel electrophoresis. Further, an in vitro cytotoxicity study of the complexes exhibited anticancer activity against the human breast cancer (MCF7) cell lines.

Key words*: Isoniazide, 2-amino-6-methylpyridine, benzoic acid, cytotoxicity, DNA cleavage and Antimicrobial studies.*

Presenting author:

E-mail: *dhivyapriyachem@gmail.com*

Structural and optical properties of nanostructured Cu doped silver oxide thin films::RF magnetron sputtering

M. Hari Prasad Reddy* and S. Uthanna

Department of Physics, Sri Venkateswara University, Tirupati – 517 502, India

Abstract

Silver copper oxide thin films find potential applications as photovoltaic cells, antibacterial coatings, cathode for microbatteries and high density optical storage devices. In the present investigation, nanocrystalline silver copper oxide films ($Ag_2Cu_2O_3$) were deposited on to glass and silicon substrates by radio frequency (RF) magnetron sputtering of metallic equimolar silver copper ($Ag_{50}Cu_{50}$) alloy target in Ar-O_2 mixture at different substrate temperatures varied from 303 to 523 K, and at fixed oxygen partial pressure of $2x10^{-2}$ Pa. The effect of substrate temperature on the physical properties of chemical composition, structure and surface morphology and optical properties of the films were systematically studied. The atomic ratio of copper to silver in the films was 0.103$\pm$ 0.010. The films formed at room temperature were nanocrystalline AgO. As the substrate temperature increased to 373 K the intensity of the AgO peak (002) was decreased while those deposited at 523 K contained the diffraction peaks of AgO along with small reflection of $Ag_2Cu_2O_3$. The crystallite size of the films determined from the X-ray diffraction peak (002) of AgO decreased from 28 to 15 nm with an increase in substrate temperature from 303 to 573 K. The grain size of the films increased from 98 to 380 nm with an increase in substrate temperature from 303 to 523 K. The optical band gap of copper doped silver oxide films formed at 303 K was 1.65 eV and at 573 K showed 2.08 eV.

Presenting author:

E-mail: *hari.phys@gmail.com*

Triphenylamine As the Efficiant Donor In Zn-Porphyrin Dye for Dye Sensitized Solar Cell Applications

Kotteswaran Shanmugam* and P. Ramasamy

SSN Research Centre SSN College of Engineering, Kalavakkam, Chennai-603110, Tamilnadu

Abstract

We have designed and synthesized two Zn-Porphyrin derivatives Zn[5,15-dimethylaminophenyl-10,20- (4-carboxyphenyl)Porphyrin] **(SKPor-1)** and Zn[5,15-thiophene- 10,20-(4-carboxyphenyl)Porphyrin] **(SKPor-2)** which possess donor modified structures as sensitizer for Dye Sensitized Solar Cells (DSSCs). These molecules contain the porphyrin unit as π-bridge, dimethylaminophenyl and thienyl groups as electron donor group and carboxylic acid group as anchoring group (electron acceptor unit). The **SKPor-1** dye haslarge red-shift of the absorption maxima due to introduction of the dimethylaminophenyl moiety at the meso position of the porphyrin ring. But the absorption maxima of **SKPor-2 is** a little red-shifted due to the thienyl group attached with the porphyrin unit. The highly conjugated dimethylaminophenylgorup is efficiently donating the electrons and electronic interaction between the porphyrin and dimethylaminophenyl unit is better compared to thienly unit. The Cyclic voltammetry analysis of the synthesized dyes have been carried out from that HOMO and LUMO values of the dyes calculated and also compared with DFT calculations. The DSSC was made using commercial P25 TiO_2 material as photoanode, Zn-Porphyrin derivatives as sensitizer, I^-/I^{3-} as electrolyte and Platinum (Pt) as counter electrode. The highest power conversion efficiency of the two Zn-Porphyrin derivatives **(SKPor-1)**based on DSSC reached **3.2 %** with open circuit voltage (V_{oc}) of 0.68 V, short circuit photocurrent density (J_{sc}) of 9.62 mA/cm^2 and fill factor (ff) of 0.50, **SKPor-2** based DSSC reached **2.5%** open circuit voltage (V_{oc}) of 0.68 V, short circuit photocurrent density (J_{sc}) of 7.2 mA/cm^2 and fill factor (ff) of 0.51 under AM 1.5 G irradiation.

Presenting author:

E-mail: *kotties555@gmail.com*

Tel: *+8870808279*

Travelling of soliton along the protofilament under various inhomogeneities

A. Muniyappan*

Department of Physics, Theivanai Ammal College for Women (Autonomous), Villiupuram-605 401, Tamilnadu, India

Abstract

Interiors of living cells are functionally organized by protein polymers – the cytoskeleton. Cytoskeleton is backbone of the cell structure. Major components of the cytoskeleton are microtubules (MTs). We apply modified extended tangent hyperbolic function (METF) method which is considered to be one of the effective algorithms for constructing nonlinear solutions of the biological system aided with symbolic computation. In this paper, we look at the excitations of nonlinear wave along microtubulin protofilament under various inhomogeneity.

Keywords: *Microtubules, Protofilaments, Solitons, Symbolic computation*

Presenting author:

E-mail: *muniyappancnp@gmail.com*

Tel: +91-4146-259674, **Fax:** 258425

Third harmonic generation and Physical properties of 2-mercaptobenzothiazole (2-MBT) single crystal

R. Asvini, M. Hemalatha, R. Supriya, **A. Muthuraja***

Department of physics, Theivanai Ammal college for women (Autonomous), Villupuram, 605602, Tamil Nadu

Abstract

An organic single crystal 2-mercaptobenzothiazole (2-MBT) was grown by slow evaporation solution growth technique (SEST). Absence of absorption in the region between 300 and 1100 nm is the major requirement for the material having NLO properties. The grown crystal has lower cut off wavelength identified at 281nm. The 2-MBT crystal possesses good transmittance at about 65%. The optical transmittance was observed in the visible region. The band gap energy of 2-MBT crystal was found to be 3.5 eV. The crystal 2-MBT third order nonlinear refractive index and absorption coefficient was studied under He-Ne laser source whose wavelength is of 632.8 nm and lens of focal length 0.3m was used.

Key words: *Organic crystal; Transmittance; Z-Scan*

Presenting author:

E-mail: *amuthuraja90@gmail.com*

Tel: *+91-9789633601, 7010117238*

Fuel with Surfactant Armoured Synthesis of Hydroxyapatite by Ultrasound Assisted Biomimetic Method

E.Sathya, I.Venda, V. Thamizharasi, and **V.Collins Arun Prakash***

Department of Chemistry, Sacred Heart College (Autonomous), Tirupattur, Vellore Dist ,635601.

Abstract

Hydroxyapatite $Ca_{10}(PO_4)_6(OH)_2$ is one of the well-known bioceramic material which has its therapeutic applications as a bone substitute material because it is structurally similar to human bone.The Ca/P ratio is very nearest to the stoichiometric value. It also has excellent biocompatibility, bioactivity and surface active properties with living tissues, osteoconductivity and non-toxicity. Particularly, this material is employed in orthopaedic and dental applications. In this research, hydroxyapatite powder was synthesized by reinforcing with urea as a fuel and polyoxyethylene lauryl ether (Brij-35) as a surfactant and Brij 35 alone, throughsonochemicalassisted with biomimetic method. Simulated body fluid is very similar to human body fluid. Precipitation process is performed using 1.5 concentrated SBF.By passing an ultrasound HAP powder is obtained with high degree of crystallinity, purity with minimal agglomeration. This work reports,synthesizing of nano-HAP powder using templates through biomimetic assisted sonochemical method by tuning the experimental parameters such as irradiation time, temperature and concentration of the mixture. Owing to its bioactivity, it has been proven that fuel and surfactant assisted calcium phosphate synthesis structure gavepure nanobioceramic powders with high degree of crystallinity after calcination. The as synthesised powder is to be tested further for its biocompatibility.

Keywords: *Hydroxyapatite, Sonochemical,Biomimetic, Brij 35, Urea.*

Presenting author:

E-mail: *sathyramltech@gmail.com, collinsnanobio@gmail.com*

Surfactant-Assisted Synthesis of Hydroxyapatite Using Hydrothermal Method

I. Venda and **V. Collins Arun Prakash***

Department of Chemistry, Sacred Heart College (Autonomous), Tirupattur, Vellore Dist. 635 601.

Abstract

Hydroxyapatite (denoted as HAP), is calcium phosphate compound with chemically represented as $Ca_{10}(PO_4)_6(OH)_2$) and it's the most extensively used biocompatible ceramic materials for the regeneration of bone tissue because of its chemical and crystallographic similarities.Hydroxyapatite is also existing as a major inorganic component of natural bone mineral phase. There are two different crystal structure of synthetic HAP (Monoclinic and hexagonal). Both the structure is closer to mineral phase of the bone. In this researchwork, Surfactant-assisted synthesis of nanohydroxyapatite powder using hydrothermal method was carried. The effects of pH and calcination temperature on the structuraland morphological properties of nanocrystalline HAP powderswere presented. Fourier transform infrared spectroscopy(FTIR), X-ray diffraction (XRD) and scanning electronmicroscopy (SEM) analysis were performed to obtain the chemical composition crystalline structure, morphology andparticle size of the HAP powders. XRDconfirms the presence of hexagonal structure in HAP.The as synthesised powder is to be tested further for its biocompatibility.

KeyWords: *Hydroxyapatite, DMSO, Biomaterials, Hydrothermal method*

Presenting author:

E-mail: *vendasugi@gmail.com, collinsnanobio@gmail.com,*

Formation of Hydroxyapatite Nanocrystals Using Thiourea By Precipitation Method

V. Thamizharasi, and **V. Collins Arun Prakash***

Department of Chemistry, Sacred Heart College (Autonomous), Tirupattur, Vellore Dist. 635 601.

Abstract

Hydroxyapatitechemically denoted as $Ca_{10}(PO_4)_6(OH)_2$is one of the most important biominerals of interest in the broad group of calcium phosphate-basedbio ceramics and the main inorganic constituent of bones and teeth. Especially it is used as anexcellentbiocompatibility, bioactivity and also osteoconductive properties. In this work, thiourea substituted HAP Nano crystalline were synthesis using precipitation method from aqueous solution of calcium nitrate tetrahydrate, potassium dihydrogen phosphate in the presence of thiourea. The synthesised sample were physically characterized such as X-ray diffraction analysis, scanning electron microscopy and FTIR. The results showed high crystalline HAP nanoparticles and SEM photograph showed that the size of the crystal was well controlled by the reaction parameters such as reaction time, temperature and the molar ratio of Ca/P.

KeyWords: *Hydroxyapatite, precipitation method, Nanostructure*

Presenting author:

E-mail: *tamilprabhu1992@gmail.com, collinsnanobio@gmail.com,*

Thermo-Mechanical Behaviour of Clay Bricks from Different Areas Of Cavery Riverbed

A.Govindasamy[a] and **G.Viruthagiri*[b]**

[a]*Research Scholar, R & D Centre, Department of Physics, Periyar University, Salem, Tamilnadu. India.*

[b]*Department of Physics, Annamalai University, Annamalainagar, Tamilnadu, India.*

Abstract

The purpose of the research presented in this paper was to determine the mechanical and thermal properties of unfired and fired clay bricks. In this study, the Physical, Chemical and mineralogical characteristics of raw materials were measured. The strength of clay brick was primarily influenced by a number of factors such as pre/post environmental condition, porosity, water absorption and density etc., among the factors affecting such behaviour, the presence of porosity & water absorption play a key role of building bricks. The experimental results demonstrate that porosity significantly reduces the compression strength of a building brick, the greater the porosity the lower compression strength. The experiments were carried out on seven different samples of clay bricks (unfired and fired) collected from different locations of cavery riverbed areas of Salem District of Tamilnadu, India. The results obtained in this study demonstrate that clay brick (fired) at TMB is the optimal mixture for both unfired and fired bricks.

Keywords: *Clay bricks, Mechanical properties, Fired bricks, thermal properties, porosity*

Presenting author:

E-mail: *gvgiri2002@gmail.com*

Influence of Ethylene Diamine Tetra Acetic Acid on Lithium Sulphate Optical Single Crystal

K.Venkatesan[1], L.Jothi[2]

[1]*Sri Vidya Mandir Arts and Science College, Uthangarai, Krishnagiri.*

[2]*NKR Arts college for Women, Namakkal.*

Abstract

In the recent years, non linear optical material attracts many industries because of high structural and spectral properties. The nonlinear optical crystal Ethylene diamine tetra acetic acid doped lithium sulphate was grown by the solution growth method using slow evaporation technique. Ethylene diamine tetra acetic acid is added with Lithium sulphate in 1:2 molar ratio and Ethylene diamine tetra acetic acid doped Lithium sulphate single crystal were grown by slow evaporation method in normal room temperature. The grown crystal was subjected to XRD, UV, FTIR, Microhardness, NLO and Dielectric studies. The crystal structure, lattice parameter and the group were determined by XRD. The band gap, absorption and emission wave length are determined by UV spectrum. The different functional groups were found by FTIR instrumentation. The mechanical property was found by hardness test. The optical properties of grown crystal were analyzed by NLO test. The Dielectric constants of the crystal were found by Dielectric studies.

Keywords: *Lithium Sulphate, Slow evapouration, Single crystal XRD, FTIR, UV, Hardnes*

Growth and characterisation of pure and amaranth dye doped Sulphamic Acid single crystals

M. Selvapandiyan[1*], J. Arumugam[1,2]

[1]*Department of Physics, Periyar University PG Extension center, Dharmapuri- 636 705, Tamil Nadu, India*

[2]*Department of Physics, Sri Vidya Mandir Arts & Science College, Uthangarai- 636902, Tamil Nadu, India*

Abstract

Amaranth dye doped Sulphamic acid single crystals have been grown by solvent evaporation method at room temperature. The lattice parameters of the grown crystals were obtained by single crystal X- ray diffraction analysis and grown crystals belong to orthorhombic crystal structure. From UV visible studies the grown crystals have good transparency through entire visible region. Vickers hardness measurement reveals that the mechanical stability of the grown crystal is increased by dopant. From photo conductivity measurement shows that the grown crystals have negative photo conductivity nature. The photograph of grown crystals is shown in Fig.1.

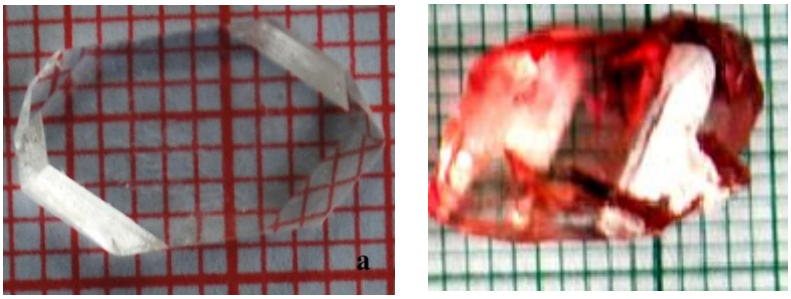


Fig. 1 As grown pure and amaranth dye doped sulphamic acid crystals

Keywords: *Single crystal XRD; UV visible; Microhardness; Photo conductivity*

Presenting author:

E-mail: *mselvapandiyan@rediffmail.com*, gramathukuil@gmail.com

Tel : *+91-99764 93935, 8526686623*

UV- Visible, Photoluminescence and FTIR Studies on sodium oxalate single crystal at three different concentrations by gel growth technique

R. Arivuselvi*, R. Dhinesh Kumar, S. Priya

PG & Research Department of Physics, SVM Arts and Science college, Katteri- 636 902, Uthangarai Tamilnadu, India.

Abstract

Sodium oxalate single crystals were grown by single diffusion gel technique using sodium meta silicate (SMS) under room temperature at three different concentrations such as 80 % sodium meta silicate + 20 % acetic acid (Sample A), 70 % sodium meta silicate + 30 % acetic acid (Sample B) and 60 % sodium meta silicate + 40 % acetic acid (Sample C). The grown crystals were characterized by UV – Visible analysis, photoluminescence test and FTIR analysis. The optical absorption spectrum shows that the grown material has highly transparent in the entire visible region. Fourier transform infrared spectrum analysis was used to confirm the presence of mode assignments in the grown crystals. The PL emission spectrum recorded in the wavelength of 340 nm depicted a UV light emission centered at 358 nm.

Key Words: *Gel growth; Sodium meta silicate; UV – Visible; Photoluminescence test; FTIR.*

Presenting author:

E-mail: *ras81svmphysics@gmail.com*

Green Synthesis of Silver Nanoparticles Using Euphorbia Hetrophylla Leaf Extract

G. Kalaiyan, K.M.Prabu, S.Suresh

PG & Research Department of physics, Sri Vidya Mandir Arts & Science college, Uthangarai 636902, TN, India

Abstract

Bio-synthesis of silver nanoparticle is a novel way to synthesis nanoparticles by using various plant components. In the present study plant leaf of Euphorbia hetrophylla were taken to investigate their potential for synthesizing silver nanoparticles. The leaf extract was mixed with silver nitrate solution of different concentration. The silver nanoparticles synthesized were at standard concentration 2 mM and confirmed by their change of colourless to dark brown due to the phenomenon of surface plasmon resonance. Characterization of the synthesized nanoparticles performed through UV spectroscopy, Fourier Transform Infra Red spectroscopy analysis, X-Ray Diffraction analysis, Scanning Electron Microscopy and High Resolution Transmission Electron Microscopy were comparatively analyzed for their absorbance, stabilization of bonds, particle sizes in terms of nanometer and the particle shapes contributing configuration respectively.

Key words: *Green synthesis, Euphorbia hetrophylla, Silver nanoparticles*

Characterization of Nonlinear Optical Amino Acid Single Crystal: L-*Threonine*

M. Selvapandiyan[a], N. Suresh*[b]

[a]*Department of Physics, Pg Extension center, Periyar University, Dharmapuri*

[b]*PG & Research Department of physics, Sri Vidya Mandir Arts and Science College, Katteri, Uthangarai.*

Abstract

Amino acid family crystals exhibit excellent nonlinear optical and electro optical properties. L-Theronine single crystal belongs to the amino acid group and has been grown by the slow evaporation solution growth technique at room temperature. The grown crystals were characterized by X-ray diffractometry (XRD), Fourier transform infrared (FTIR) spectroscopy, UV−Vis and Raman spectroscopy. Its laser damage threshold was measured and its nonlinear optical response was tested by using a Q-switched Nd:YAG laser, and the value of laser damage threshold is greater than that of potassium dihydrogen phosphate (KDP).

Presenting author:

E-mail: *Sureshsvm1984@gmail.com*

Investigation of antibacterial efficiency of zinc oxide nanoparticles using rice flour as biotemplate

Sakthivel P[1], Alison Christina Fernandez[2], Joe Jesudurai[3]

[1]Department of Physics,Dr. N.G.P. Arts and Science College , Coimbatore 641048, Tamil Nadu, India

[2]PG Department of Physics, Women's Christian College, Chennai 600006, Tamil Nadu, India

[3]Department of Physics, Loyola College, Chennai 600034, Tamil Nadu, India

Abstract

In the present work, green synthesis of zinc oxide nanoparticles were successfully synthesized by green synthesis using rice flour as a biotemplate. The formation of ZnO nanoparticles were characterized by Powder X-ray diffraction (PXRD), Energy-dispersive X-ray spectroscopy (EDS) and scanning electron microscopy (SEM). The as-synthesised Zinc oxide nanoparticles were also subjected to antimicrobial studies to study its biological properties. The PXRD pattern reveals thatZnO sample belongs to hexagonal phase and the SEM images show that the particles are a combination of flakes and nanorods. The antibacterial studies revealed the response of the pure and rice flour template samples response towards *staphylococcus aureus* and *klebsiella pneumonia* by agar well diffusion method.

Temperature influenced anatase phased TiO_2 nanostructure films physical properties and gas sensitivity improvements

V. Gopala Krishnan[a*], P. Sakthivel[a], P. Elango[b]

[a]*Department of Physics, Dr. N.G.P Arts and Science College, Coimbatore - 641048, India.*

[b]*Department of Physics, Government Arts College, Coimbatore - 641018, India.*

Abstract

Anatase phased TiO_2 films prepared at different temperature by ANSP method. TiO_2 films show the tetragonal structure by increase the temperature in XRD study. The XPS study shows anatase Ti^{4+} with the primary element of Ti 2p, O 1s, Ti 3p, Ti 3s, O 2s peaks. The thicknesses of the produced films have been progressively reduced and their average roughness has been progressively increased as a function of temperature by a 3D optical profilometer and an AFM study, respectively. The FESEM study shows that the uneven cracked surface of the coated films (at 300°C) transforms into agglomerated particles, closed and uniformly distributed, by raising the temperature. The oscillation transmittance (%) with redshift absorption edge was observed and the band gap of 3.58 to 3.33 eV was determined by optical investigation. The study of gas sensors shows a better response to C_2H_6O reducing gas at 300°C with 150 ppm.

Keywords: *ANSP method; XRD & XPS study; 3D optical profilometer; AFM & FESEM Study and gas sensing behavior*

Presenting author:

E-mail: yuvagopal@yahoo.in

Tel.: *+914222369253; +918056455006; fax: +914222369253*

Bin Model Solar Instant Water Heater Using Multiple Pipe Line Collector With Brass Obsorber

K.Vikramprasad, N.Sethupathi

Department of Physics, Arignar Anna Govt. Arts College Namakkal-2.

Abstract

Renewable energy sources are one of the great ways for sustainable development awareness in India, the main focus on solar energy. Solar energy is the chief alternative to replace the conventional energy sources. Converting solar energies to heat water technologies should be one of the best preferences in the direction toward acquiring a satisfactory energy system. A Bin model solar instant water heater was designed, constructed, performance studied and used various homes and industrial applications. In this paper, a bin model instant water heater was mixed of the multiple pipe line solar instant water heater Brass collectors' path. Multiple pipe line collectors was literally larger amount of heat harvesting area, when it was placed in the set up of bin model solar instant water heater then efficiency was increased. The article denotes the bin model solar water heater using multiple pipe line or studied with their application dare discussed. Because of hot water is preference beyond the reach of average homes in rural areas. The study was conducted by solar radiation, inlet, outlet, ambient, middle temperatures, wind velocity measurements, flow rate, efficiency analysis are denoted.

In-Vitro Antimicrobial Activity of *Crotalaria Verrucosa* Medicinal Plant

J.Sirajudeen and **R.Elamparithi***

PG and Research Department of Chemistry, Jamal Mohamed College, (Autonomous), Tiruchirappalli, Tamil Nadu, India

Abstract

Communicable diseases are very serious problem at present as well as in past also in developing in addition to developed countries. It is caused by various pathogenic microbes like fungi, bacteria, parasites and virus etc. In recent years, there has been a growing interest in researching and developing new antimicrobial agents from various sources to combat microbial resistance. Therefore, a greater attention has been paid to antimicrobial activity screening and evaluating methods. Herbal medicines are generally used for healthcare because they have low price and wealthy source of antimicrobial properties. Antimicrobial activity of various plant parts such as bark, stem, leaf, fruit and seed against Gram negative, Gram-positive bacteria and fungal species, using hydroalcohol extraction by well diffusion method. The microorganisms employed were were*Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Salmonella typhi* and *Aspergillusflavus*, *Aspergillusniger*, *Aspergillusfumigatus*, *Penicillium* sp. and *Aspergillusterreus*. Hydroalcoholic extract of *crotalaria verrucosa*were potentially efficient with variable efficiency against the tested bacterial and fungal strains at different concentrations.

Keywords: *Antimicrobial activity, Secondary metabolites and Pharmaceuticals*

Presenting author:

E-mail: *rparithi11@gmail.com*

Synthesis spectral characterisation, single crystal XRD and biological activities of Co(II) and Cu(II) Complexes containing Dibasic tridentate schiff base.

S.Jayapriya*

St. Joseph College for Women, Tirupur.

Abstract

Four coordinated Co(II) and Cu(II) Schiff bas3 complex of general formula [M(PPh_3)L] (where L = Mono nucleating dibasic tridentate Schiff base were derived by condensing Isonized and o-vanilline in equimolar ratio in ethanolic medium) have been synthesised and characterised by elemental analysis, spectral studies (FT-IR, NMR and UV-Vis) and single crystal X-ray diffraction analysis (XRD) confirms the monoclinic structure of the ligand. A square planar geometry has been tentatively proposed for all the new complexes. The new complex [Co(PPh3)L] and [Cu(PPh3)L] exhibit modrate DNA binding and Antioxidant assays.

Keywords: *Schiff base, elemental analysis, spectral studies, square planar geometry, antioxidant assays.*

Presenting author:

E-mail: *Jayapriyasengottayan@gmail.com.*

Dual property of chitosan blended copolymer membranes: Antidiabetic drug release profile and antimicrobial assay

E. Jaisankar*

Department of Chemical Engineering, Coimbatore Institute of Technology, Coimbatore 641014, Tamil Nadu, India

Abstract

A copolymer membrane involving thiourea, phenylhydrazine and formaldehyde blended with chitosan was studied to predict the metformin drug release profile from the membrane and its kinetics. The membrane was characterized with elemental, scanning electron microscopy and FTIR spectroscopy to identify the empirical formula, empirical weight, surface and functional group changes occurred during the incorporation of chitosan to the copolymer. The swelling behaviour, drug loading efficiency and drug release profile were extensively studied and the obtained results were measured by UV-visible spectroscopy. The reactive sites, better porosity and larger surface area provided by the increased content of chitosan to the copolymer led to higher drug loading efficiency and controlled drug release profile. Kinetic study revealed swelling and diffusion controlled mechanism for the membrane; from Ritger-Peppas and Higuchi model. The chitosan and its copolymer membranes were tested for antimicrobial assay using selective gram-positive and gram-negative bacterial and fungal strains. CS-TPF-drug matrix showed an acceptable control of the growth of all the microbial species compared to CS, CS-drug and the standard metformin drug.

Keywords: *chitosan, copolymermembrane; drug delivery; kinetics; antimicrobial assay*

Presenting author:

E-mail: *jaisankar033@gmail.com*

Vibrational and Spectral Analysis on FT-IR, FT-Raman, NMR and Docking of 4-Methoxyphenylboronic acid (4MPBA) by using DFT

S.Sundari[a] and **S.Chandra[b]***

[a]*Research Scholar, Department of Physics, Annamalai University, Annamalai Nagar, Chidambaram – 608002.*

[b]*Assistant Professor, Department of Physics, Arignar Anna Govt Arts College, Attur - 636121*

Abstract

The geometrical parameters, nuclear magnetic resonance (NMR) and vibrational frequencies of the 4-Methoxyphenylboronic acid (4MPBA) have been performed using density functional theory (DFT) B3LYP method with 6-311++G(d,p) basis set. The experimental Infrared and Raman spectra were obtained in the region 4000-400cm^{-1} and 3500-100cm^{-1} respectively. In addition these, HOMO and LUMO energies and thermodynamic parameters were presented. The ^{1}H & ^{13}C NMR chemical shifts were calculated by the gauge independent atomic orbital (GIAO) method and compared with the experimental data. Firmness of the molecule arising from hyper conjugative interactions, charge delocalization has been analyzed using natural bond orbital (NBO) analysis. From the title molecule various ligand are using in the cervical cancer protein by docking. From these 4MPBA has been screened to antimicrobial activity and found to exhibit antibacterial effects.

Keywords: *FT-IR, FT-Raman, ^{1}H & ^{13}C NMR, HOMO – LUMO, Docking and Antibacterial Activity.*

Structural and optical properties of pure and Mg doped ZnO nanoparticles produced by using *Psidium guajava* leaves extracts

P. Vijaya Kumar, M. Karthikeyan and **A. Jafar Ahamed***

PG and Research Department of Chemistry, Jamal Mohamed College (Autonomous), Tiruchirappalli – 620 020, Tamil Nadu, India.

Abstract

Nanostructured materials have been extensively explored for the fundamental scientific and technological interests in accessing new classes of functional materials with unprecedented properties and applications. The pure and Mg doped ZnO nanoparticles were successfully synthesized by green methodusing *Psidium guajava* leaves extract as reducing as well as capping agent.The synthesized pure and Mg doped ZnO NPs was calcined at 700°C.The structural properties was confirmed by X-Ray diffraction (XRD), Fourier transform infra-red (FT-IR) spectroscopy, Field emission scanning electron microscopy (FESEM), Elemental analysis (EDAX) and optical properties were studied by UV–Vis spectroscopy and Photoluminescence (PL).

Key words: *Zinc Oxide, Nanoparticles, Mg doped ZnO and Psidium guajava.*

Presenting author:

E-mail: *agjafar@yahoo.co.in: pdvijayjmc@gmail.com*

Green synthesis, structural and optical properties of pure and Ag doped ZnO nanoparticles produced by using *Mangifera indica* leaves extracts

M. Karthikeyan, P. Vijaya Kumarand **A. Jafar Ahamed***

PG and Research Department of Chemistry, Jamal Mohamed College (Autonomous), Tiruchirappalli – 620 020, Tamil Nadu, India.

Abstract

Nanostructured materials have been extensively explored for the fundamental scientific and technological interests in accessing new classes of functional materials with unprecedented properties and applications. The pure and Ag doped ZnO nanoparticles were successfully synthesized by green methodusing *mangifera indica* leaves extract as reducing as well as capping agent.The synthesized pure and Ag doped ZnO NPs was calcined at 700°C.The structural properties was confirmed by X-Ray diffraction (XRD), Fourier transform infra-red (FT-IR) spectroscopy, Field emission scanning electron microscopy (FESEM), Elemental analysis (EDAX) and optical properties were studied by UV–vis spectroscopy and Photoluminescence (PL).

Key words: *Zinc Oxide, Nanoparticles, Ag doped ZnO and mangifera indica.*

Presenting author:

E-mail: *agjafar@yahoo.co.in: pdvijayjmc@gmail.com*

ZnO/CdS Nanocomposites under Optimized Annealing Effect Prepared With Chemical Precipitation Technique

L.Arunraja[a*], L.Dhatchinamurthy[a], S.Karthikeyan[a], R.Jayanth[b]

[a] *Assistant Professor, Department of Electronics & Communication, K.S.Rangasamy College of Arts & Science (Autonomous), Tiruchengode.*

[b] *Student, Department of Electronics & Communication, K.S.Rangasamy College of Arts & Science (Autonomous), Tiruchengode.*

Abstract:

Zinc oxide doped Cadmium sulfide (ZnO/CdS) nanocomposites had been synthesized the usage of easy chemical precipitation method at room temperature. ZnO/CdS and ZnO/CdS-473K samples were characterized the usage of diverse spectral techniques. The XRD pattern well-known shows each in hexagonal and cubic structure of ZnO/CdS and ZnO/CdS-473K nanocomposites. The values of band gap energy for ZnO/CdS and ZnO/CdS-473K had been obtained respectively, 3.2 and 3.1 eV. The surface morphology became investigated using transmission electron microscope (TEM).

Keywords: *Nanocomposite; Morphology; Precipitation; XRD; TEM.*

Presenting author:

E-mail: dharun24@gmail.com

Tel.: +91- 9047209897

Effect of two Different Thicknesses of ZnO Thin Films on the Photocatalytic Activities

S.Rajesh[1], **V.Kathiravan[2]***

[1]*Department of Physics, Pachaiyappa's College for men, Kanchipuram-631 502.*

[2]*Department of Physics, Annai College of Arts & Science, Kovilacheri, Kumbakonam-612 503.*

Abstract

Zinc oxide (ZnO) thin films with two different thicknesses (600 nm and 800 nm) were successfully deposited onto the glass substrates using a simple and inexpensive SILAR technique. The structural, optical and morphological properties of these films were characterized using X-ray diffraction, UV-vis spectrophotometer, PL spectroflurometer and scanning electron microscope, respectively. The X-ray diffraction analysis shows that the prepared film has polycrystalline nature and the crystallite grown predominantly along (002) plane of hexagonal wrutzite structure. The average transmittance of the films is found to be in the range of 55-75 % in the visible region. The optical transmittance and band gap are found to decrease for the film with 800 nm thicknesses. The scanning electron micrographs show that the grain size tends to decrease with increase of film thickness (800 nm). The decrease in PL emission of film of 800 nm could be the result of decreased rate of recombination of electron-hole. The photocatalytic activities of prepared films were investigated for the photodegradation of methylene blue under UV radiation and the photocatalytic efficiency is found to maximum (87.5 % for 80 min) for the film with 800 nm thicknesses.

Keywords: *ZnO thin film, thickness, morphology, photocatalytic activity*

Presenting author:

E. mail: *rajeshphdphy@gmail.com,*

***E. mail:** *kathiravan626@gmail.com*

Mn Doped TiO_2 Nanoparticles on Tailoring the Higher Band Gap Energy Materials

P. Praveen[a]*, G. Viruthagiri[b], S. Mugundan[c], M. Jothibas[d], M. Prakash[e]

[a]*PG & Research Department of Physics, St. Joseph's College of Arts & Science (Autonomous), Cuddalore-607001, Tamilnadu, India.*

[b]*Department of Physics, Annamalai University, Annamalai Nagar-608002, Tamilnadu, India.*

[c]*Sri Vijay Vidyalaya College of Arts & Science (Women's), Dharmapuri-636807, Tamilnadu, India.*

[d]*Department of Physics, T.B.M.L. College, Porayar-609307, Tamilnadu, India.*

[e]*PG & Research Department of Physics, Urumu Dhanalakshmi College, Tiruchirapplli-620019, Tamilnadu, India.*

Abstract

Pristine and Manganese (Mn) doped TiO_2 nanoparticles with different weight percentages (4, 8, 12 & 16 wt.%) were synthesized by Sol–Gel technique at room temperature with appropriate reactants. The X-Ray Diffraction (XRD) patterns confirmed the tetragonal crystal structure and, the average crystallite sizes and lattice parameters were determined for all synthesized compositions. The functional groups and purity of the prepared products were identified by Fourier Transform Infra-Red (FTIR) spectroscopy. UV-Vis-Diffuse Reflectance Spectroscopy (DRS) measurements indicated a blue shift in the absorption band edge upon Mn doping. The allowed direct and indirect band gap energies, as well as the crystallite sizes (Brus model) of obtained nanoparticles were calculated. The both pure and Mn doped TiO_2 nanoparticles could exhibit obvious Photoluminescence (PL) signals demonstrating that Mn dopant has resulted into new PL phenomena. Nanostructures of samples and elemental identification were done by Scanning Electron Microscopy (SEM) with Energy Dispersive X-ray (EDX) analysis. The thermal decomposition, major mass loss and phase transformation of dried powders were investigated by Thermo-Gravimetric/Differential Thermal Analysis (TG/DTA). The Nonlinear Optical (NLO) test confirmed the Second Harmonic Generation (SHG) efficiency of Mn-TiO_2 nanomaterial was higher than that of pure titania. In particular, a novel photocatalytic activity of the catalysts was assessed using methylene blue (MB) dye as a model contaminant under sunlight irradiation.

Keywords: *Sol–Gel technique; Mn-TiO_2; Crystal structure; Band gap energy SHG efficiency; Photocatalytic activity.*

Presenting author:

E-mail: *drdhanapriyan@gmail.com***; Tel:** *+91-9578686487*

Magnetic Behaviour and Antibacterial Activity of Undoped and Co^{2+} Ions Doped CuO Nanostructures

S. Ramya[1]*, G. Viruthagiri[2], N. Shanmugam[3], R. Gobi[4]

[1]*Department of Physics, Shri Sakthikailassh Arts & Science College for Womens, Military Rd, Ammapet, Salem 636003, Tamil Nadu, India*

[2]*Department of Physics, Government College for Women, Kumbakonam, Indira Gandhi Road, Kumbakonam, Tamil Nadu 612001*

[3]*Department of Physics, Gnanambigai College for Women, Dharumapuram Road, Nagapattinam, Mayiladuthurai, Tamil Nadu 609001, India*

[4]*Department of Physics, Arignar Anna Government Arts College, Namakkal-637002, Tamil Nadu, India*

Abstract

Among the common ferromagnetic metals, cobalt has distinct magnetic properties, so in this study pure and cobalt doped CuO nanoparticles (0.05, 0.075, 0.1 and 0.125 M) were synthesized by simple chemical precipitation method. The synthesized product were characterized by X-ray diffraction (XRD), X-ray photoelectron spectroscopy (XPS), field emission scanning electron microscopy (FE-SEM), energy dispersive X-ray analysis, UV-visible spectroscopy (UV-Vis), photoluminescence (PL) studies, and the surface morphology and particle size and structure pattern were studied by using HR-TEM and SAED pattern. Finally the magnetic properties studied by VSM. Interestingly, the morphology was found to change considerably from sphere to rod shape with the variation of cobalt concentration. The optical band gap calculated using UV-DRS was found to be 1.94 eV for pure CuO and increase upto 2.95 eV with increasing cobalt content. Photoluminescence studies also confirm these results. The magnetic measurements pointed to improvement of the magnetic parameters of the synthesized Co doped CuO nanostructures with the undoped CuO.

Keywords: *Ferromagnetic metals, Photoluminescence, HR-TEM, UV-Vis.*

Presenting author:

E-mail: *ramyaselvakumar19@gmail.com.*

Tel: *+91-9789695366*

Ultrasonic Velocity, Density and Viscosity Studies in Ternary Liquid Mixture of Acetone + Benzylamine + N-Hexane At 303k

S.Rajesh[1*] and V.Balasubramanian[2]

[1]*Department of Chemistry, Sri Akilandeswari Women's College, Vandavasi.*

[2]*Department of Chemistry, AMET University, Chennai, Tamilnadu, India.*

Abstract

The ultrasonic velocity can be measured using a single crystal variable path interferometer with 2MHz by standard procedure at different temperatures. These data have been use to compute adiabatic compressibility, free volume, internal pressure, acoustic impedance, free length, absorption coefficient, viscous relaxation time, available volume, cohesive energy, lenard jones potential, free energy of activation and molecular interaction parameter. The density and viscosity of ternary liquid mixture can be measured by using the specific gravity bottle method and Oswald viscometer respectively. This paper investigates the theoretical aspects for the ultrasonic and molecular interactions in ternary liquids.

Keywords: *Ultrasonic velocity, density, binary mixture, molecular interactions, interferometer, acetone, benzylamine and n-hexane.*

Presenting author:

E-mail: *anbuphy85@gmail.com.*

Tel: *+91-9843318360*

Green synthesis of CuO nanoparticles using *catharanthus roseus* leaf extract and their antibacterial activity

M. Anbuvannan[1]*, M.Ramesh[2]

[1]*Department of Physics, Sri Akilandeswari Women's College, Wandiwash-604408, Tamil Nadu, India*

[2]*Department of Physics, M.V. Muthiah Government Arts College for Women, Dindigul- 624001.Tamil Nadu, India*

Abstract

CuO nanoparticles have been synthesized via a simple green method .The XRD patterns showed monoclinic phase. The average grain size lies between 20-30 nm were obtained from XRD study as well as FT-IR spectra revealed the functional groups of stretching bands for CuO nanoparicles were found around 800-400 cm^{-1}. The primary and secondary amines/amides are major functional groups involved in the copper nanoparticle synthesized using *Catharanthusroseus* extract. Scanning electron microscopy (SEM) and transmission electron microscopy (TEM), respectively.

KeyWords: *Green synthesis, CuO, antibacterial activity.*

Presenting author:

E-mail: *anbuphy85@gmail.com*

Tel: *+91-9843318360*

The enhancement on thermal stability of Sn doped CdO Nanoparticles by chemical precipitation method

A. Venkatesan*

Department of Physics, Annai College of Arts and Science, Kovilacheri, Kumbakonam, Tamil Nadu-612 503, India.

Abstract

In this research, the chemical precipitation method was used to synthesize Sn doped cadmium oxide nanoparticles. The melting points, decomposition point and thermal stability were evaluated by TG–DTA measurements. The decomposition point temperature at 416 ^{o}C indicate that the 3% Sn doped CdO Nanoparticles have more thermal stability compare with pure and 1%, 2% Sn doped CdO Nonaparticles. The XRD analysis demonstrates that the prepared samples are good crystalline nature with nm scale range. The pure and Sn doped CdO nanoparticles where calculated from Scherrer equation, the calculated particles sizes are around 25 nm. The presences of metal oxide peaks are present in the corresponding region where confirmed by FT-IR. The spherical surface morphology of prepared samples where predicted by scanning electron microscopy. The TEM indicate that the prepared samples are nm range with well crystallinity.

Keywords: *Sn doped CdO, nanoparticles, TEM*

Presenting author:

E-mail: *akvenkat1989@gmail.com*

Synthesis and Characterization of PVP Capped CdS/ZnS core shell nanoparticles Prepared by Precipitation Method

S.Malarvizhi[1], S.Cholan[2], P.Praveen[3], N.Kannadasan[4], **S.Mugundan[1]***

[1]Sri Vijay Vidyalaya college of arts and science, Dharmapuri - 636807

[2]Sri Vidya Mandir Arts & Science College, Katteri - 636902

[3]St. Joseph's College of Arts & Science, Cuddalore - 607001

[4]ERK Arts and Science College, Erumiyampatti - 636905

Abstract

In the present investigations, we report the synthesis of CdS, ZnS, CdS/ZnS and PVP Capped CdS/ZnS core/shell nanoparticles using cadmium/ zinc compounds as single precursors. We compare the structural, functional, optical properties of the uncapped core/shell nanoparticles to capped core/shell nanoparticles. The synthesized nanoparticles were characterized by the techniques like X-ray diffraction (XRD), UV-Vis absorption spectroscopy, Scanning Electron Microscopy (SEM) and Energy Dispersive Spectroscopy (EDS). XRD and EDS were employed to confirm the phase formation and phase purity respectively. SEM micrographs showed that morphology of the parent compound ZnS/CdS is considerably changed with capped nanoparticles. The HRTEM micrographs of the core/shell nanoparticles show well defined, spherical particles with larger diameters than the particles of the parent material.

Keywords: *CdS/ZnS, Core/shell nanoparticles, capped nanoparticles*

Presenting author:

E-mail: *mugugum@gmail.com*

Tel: *+91-9600689899*

Synthesis and characteristics of size controlled EDTA capped hexagonal CdS nanoparticles and their surface structures

S.Malarvizhi[1], S.Cholan[2], P.Praveen[3], S.Ragupathy[4], **S.Mugundan[1]***

[1]*Sri Vijay Vidyalaya College of arts and science, Dharmapuri - 636807*

[2]*Sri Vidya Mandir Arts & Science College, Katteri - 636902*

[3]*St. Joseph's College of Arts & Science, Cuddalore - 607001*

[4]*ERK Arts and Science College, Erumiyampatti - 636905*

Abstract

The nanosized semiconductor nanostructures composed of a core of CdS/ZnS nanocrystals is capped with EDTA a nanoparticle has been synthesized by using a Precipitation method. The nanostructures are characterized by optical absorption spectroscopy, X-ray diffraction (XRD) and high-resolution transmission electron microscopy (HR-TEM). XRD and TEM studies show the formation of cubic CdS/ZnS nanoparticles with average size 16 nm. The structural aspects of nanocrystals have been investigated by high-resolution transmission electron microscopy. The EDTA capped CdS/ZnS nanoparticles are prepared by non aqueous method wherein cadmium acetate is used as the cadmium source and Sodium sulphide as the sulphur source. The CdS/ZnS core/shell heterostructure has been confirmed by structural properties. The epitaxy of ZnS on CdS has been observed, abrupt CdS/ZnS interfaces have been found and the absorbance mode between the two materials has been analysed in optical properties. It has been shown that the ZnS shell grows with the same structure as the CdS core, which is either in the cubic blende type structure or in the hexagonal wurtzite type structure.

Keywords: *EDTA capped CdS/ZnS, Core/shell nanoparticles, capped nanoparticles*

Presenting author:

E-mail: *mugugum@gmail.com*

Tel: *+91-9600689899*

Growth and Characterization of pure and doped L-arginine acetate Single Crystals

V.Gandhimathi*

Dept of physics, Shri Kanchi Krishna College of Arts and Science, Kanchipuram.

Abstract

Single crystals of Pure and (Cu, Zn, and Ni) doped L-arginine acetate crystals were grown from low temperature solution growth technique by slow evaporation method using water as solvent. of The crystalline nature grown crystal was confirmed by powder X- ray diffraction analysis and FT-IR analyses used to identify the presence of various functional groups of the grown crystals. The UV-VIS-NIR transmittance study was performed to analyze the optical behavior of the crystal. The SEM-EDAX analysis has been used to analysis the structures on the surfaces of the crystals and elemental analysis on a micro area without destroying the specimen.

Keywords: *Crystal growth, L-arginine acetate, Powder XRD, FTIR, UV-VIS, SEM*

Presenting author:

E-mail: *svgandhi23@gmail.com*

Synthesis of Ni doped SnO_2 Nanoparticles And its Influence of Photocatalytic and Antibactrial Properties

A.Ameer Baig *, R. Vadamalar

PG and Research Department of Physics, Muthurangam Govt. Arts College, Ottari road, Bagayam, Vellore- 632002. Tamilnadu, India.

Abstract

Herein Ni doped SnO_2 nanocrstalline powder will be synthesize by Conventional Microwave Irradiation method 1 KW (2.45 GHZ) from $SnCl_2$. $2H_2O$ and $NiCl_2$. $6H_2O$. Nanoparticles crystallize in Ni (2%), Ni (4%) dope with SnO_2 nanoparticles and constant temperature (550^0 C) at time (4 Hours) respect to other methods. The samples will be Collected and characterize by X-Ray Diffraction (XRD) , Fourier Transform infrared spectroscopy (FTIR), High Resolution Scanning Electron Spectroscopy (HR-SEM), EDAX, Ultra Violet-Diffuse reflectance spectroscopy (UV-DRS) , Photo Luminescence (PL), Antibacterial and Photo catalytic Studies. Ni dopent is promising noble metal additives low cost and effective. SnO_2 based on Such as Gas sensor, Solar cells, LED lights and Li-ion batteries applications.

Keywords: *Effect of doping, Ni, SnO_2 Nanoparticles, XRD, HR-SEM, UV-DRS, Antibacterial and Photo catalytic Activity.*

Presenting author:

E-mail: *ameerramphysics@gmail.com*

Tel: *+91- 9486787172*

Theoretical and Experimental investigation on mc-Si growth process

M. Srinivasan* and P. Ramasamy

SSN Research Centre, SSN Institutions, Chennai-603110.

Abstract

Among all the renewable energy sources, PV solar cell plays a main role. Single crystal and multi- crystalline solar cells are considered as first generation solar cells. Thin film based solar cells (a-Si, micromorph, CdTe/CdS and CIGS) are considered as second generation solar cells. Nano-crystalline based dye-sensitized solar cells (DSSCs), polymer-based solar cells and concentrated solar cells are considered as third generation solar cells. There is lot of crystal growth in several of these solar cells.

We have been working on the following three type of solar cells which involves plenty of crystal growth:

1. mc-Si by DS method.
2. TiO_2 nano-crystals for DSSCs
3. Micromorph& Nano-wire based a-Si solar cells by PECVD.

The majority of PV solar cells are fabricated from bulk silicon crystals, which may be either single-crystalline or multi-crystalline. A market share ofmono- and multi-crystalline silicon (mc-Si) are more than 90% at present and will be so in the foreseeable future. Single-crystalline wafers typically have better material parameters but are also more expensive which are grown by Czochralski (Cz) growth process. CZ wafers contain a large amount of oxygen in the silicon wafer. Oxygen impurities reduce the minority carrier lifetime in the solar cell, thus reducing the voltage, current and efficiency. In addition, the oxygen and complexes of the oxygen with other elements may become active at higher temperatures, making the wafers sensitive to high temperature processing. To overcome these problems, Float Zone (FZ) wafers may be used. Due to the difficulty in growing large diameter ingots and the often higher cost, FZ wafers are typically only used for laboratory cells and are less common in commercial production. Multi-crystalline silicon (mc-Si) is an important material with advantages of low-production cost and high conversion efficiency. It has a market share of more than 60% in all photovoltaic materials. Directional solidification (DS) method has become the leading technique for producing mc-Si because of its better feedstock tolerance, higher throughput and easier operation.Solar cell efficiency is decreased by impurities, precipitates, and structural defects in the mc-Si ingots. The generation and distribution of these are investigated using numerical analyses in this paper. Simulation of heat and mass transfer in bulk growth has become an indispensable tool for an efficient, time and cost

saving optimization procedure. A global modelling of heat transfer was performed to study the generation of creep stress and formation of dislocations in multi-crystalline silicon at the various growth stages for the various modified DS systems. The aim is to increase average grain size in silicon multi-crystals and reduce the impurities distribution and dislocation density.

Presenting author:

E-mail: *srinivasanm@ssn.edu.in*

Development of High Quality 4-Nitrophnol Derivative Nonlinear Optical (NLO) Single Crystals: A Novel Rotational Unidirectional Method

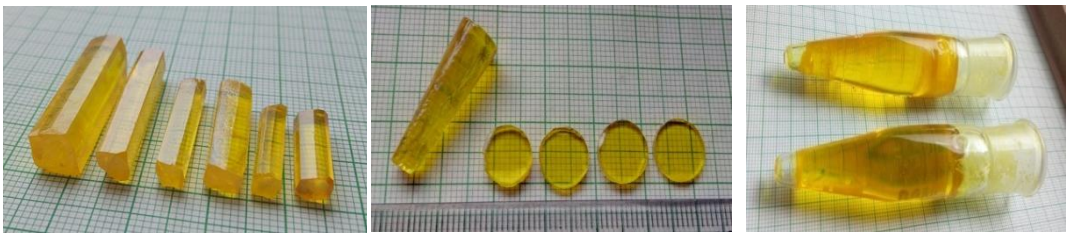
Muthu Senthil Pandian*, P. Ramasamy

SSN Research Centre, SSN Institutions, Chennai-603110, Tamilnadu

Abstract

Gravity driven concentration gradient is used in the uniaxially solution-crystallization method of Sankaranarayanan-Ramasamy (SR). TGS, GPI, KAP, SSDH, DGZCD, DGBCM, benzophenone and many more crystals have been successfully grown by SR method. Longest benzophenone crystal having dimension of 1350 mm length and 55 mm diameter was grown for the first time in solution growth by SR method. Starting with a thin plate as seed a large size crystal can be grown. The physical properties and crystalline perfection of the SR method grown crystal is normally superior to the conventional method grown crystals. The quality of the SR method grown crystals has been improved by several modifications made in SR method. The impurity segregation cannot be avoided in the existing SR method. So we planned to introduce the RSR method for growing good quality, unidirectional single crystals. The effect of rotation on unidirectional crystal growth method (Rotational Sankaranarayanan - Ramasamy (RSR)) has been proposed for the first time. The organic nonlinear optical 2-Aminopyridinium 4-nitrophenolate 4-nitrophenol (2APNP) crystals have been grown by (i) conventional slow evaporation, (ii) Sankaranarayanan-Ramasamy (SR) method and Rotational SR (RSR) method. The grown 2APNP crystals were subjected to various studies like HRXRD, laser damage threshold, chemical etching, Vickers microhardness, birefringence, UV-Vis NIR, dielectrics and piezoelectrics. The Rotational Sankaranarayanan-Ramasamy (RSR) method grown crystals show excellent optical, mechanical, dielectric and piezoelectric behavior and higher laser damage threshold capability compared to the conventional and normal SR method grown crystals. HRXRD and etching studies showed that the quality of the RSR method grown crystal is better than conventional and normal SR method grown crystal. The Rotational Sankaranarayanan-Ramasamy (RSR) method can be used to grow single crystals along a specific crystallographic direction such as the phase matching direction in nonlinear optical (NLO) crystals. The unidirectional crystal growth method is ideally suited for crystal growth along this direction to obtain large size crystals required for obtaining SHG elements with minimum wastage. In addition, the unidirectional solution crystallization usually occurs at around room temperature; much lower thermal stress is expected in these crystals over those

grown at high temperatures. Successful development of this unidirectional method will provide the technology to produce crystals at a yield close to 100% and easy scaling-up process.



2AP4N crystals grown by (a) Conventional method, (b) SR method and (c) RSR method

Presenting author:

E-mail: *senthilpandianm@ssn.edu.in*

Tuning the lifetime from molecular engineering of carbazole donor based Metal-Free organic dyes for dye sensitized solar cells – A computational approach

V. Mohankumar, P. Pounraj, M. Senthil Pandian, **P. Ramasamy***

SSN Research Centre, SSN College of Engineering, Chennai - 603 110, Tamil Nadu, India

Abstract

The metal free organic sensitizers for dye sensitized solar cells (DSSC) have been developed from carbazole donor based on D-π-A architecture. From the structural modifications the optical and electronic properties of the dyes were tuned. In the present investigation series of carbazole donor based metal free dyes were studied using density functional theory (DFT) and time-dependent density functional theory (TDDFT). The optimized geometry, frontier molecular orbitals, energy levels and electronic absorption spectrum were studied. The natural bond orbital analysis (NBO) gives the net electron transfer from the donor to acceptor. The electrochemical properties and light harvesting efficiency of the designed dye sensitizers were calculated. The π spacer increase induced the absorption peak and red shift was noted. The life time was increased by adding phenyl ring in the donor side. Based on theoretical calculations designed dye molecules are evaluated for DSSC application.

Keywords: *DSSC; Density Functional Theory; HOMO-LUMO; Life time*

Presenting author:

E-mail: *ramasamyp@gmail.com*

Adsorption and Removal of Rhodamine-B dye from Aqueous Solution Using Low-Cost Adsorbent

[1]Dr.R.Sivakumar, [2]Dr.S.Arivoli

[1]Department of Chemistry, JJ College of Arts & Science, Pudukkottai, Tmilnadu,India

[2]Department of Chemistry, Poompuhar College, Melaiyur, Nagapattinam,Tmilnadu,India

Abstract

The presence of Rhodamine-B(Rh-B) dye in wastewater is a potential hazard to aquatic animals and humans. There are various mechanisms proposed, kinetic models used and adsorption isotherms employed for the efficient removal of Rhodamine-B dye from industrial and municipal wastewaters using biosorbent. Biosorption of dye is a most promising technology involved in the removal of toxic dye from industrial waste streams and natural waters. Dye removal treatment systems using natural materials are cheap because of the low cost of sorbent materials used and may represent a practical replacement to conventional processes. The work aims at adsorption studies of Rh-B dye from aqueous solution onto activated nano carbon prepared from *Syringodium Isoetifolium* Leaves, by acid treatment was tested for its efficiency in removing Rh-B dye. The process parameters studied include agitation time, initial dyes concentration, adsorbent dose, pH and temperature. The adsorption followed second order reaction equation and the rate is mainly controlled by intra-particle diffusion. The equilibrium adsorption data were correlated with Langmuir, Freundlich, Temkin, Dubinin-Radushkevich, Hurkins-Jura, Halsay, Redlich-Peterson, Jovanovich and BET isotherm models. The influence of pH on Rh-B dye removal was significant and the adsorption was increased with increase in temperature. A portion of the Rh-B dye was recovered from the spent ASI-NC using 0.1M HCl.

KeyWords:*Activated Syringodium Isoetifolium Leaves Nanocarbon (ASI-NC), Rhodamine-B dye, Biosorption, Thermodynamics, Kinetics, Equilibrium models.*

Investigation report on synthesis and characterization of nanocomposite thinfilms for sensor applications

S.Karthikeyan[1, 3*], K.Dhanakodi[2], K.Shanmugasundaram[2], L.Arunraja[3]

[1]*Research Scholar, Department of Electronics, Sri Ramakrishna Mission Vidyalaya College of Arts and Science (Autonomous), Coimbatore-641020*

[2]*Assistant Professor, Department of Electronics, Sri Ramakrishna Mission Vidyalaya College of Arts and Science (Autonomous), Coimbatore-641020*

[1,3]*Assistant Professor, Department of Electronics and Communication, K.S.Rangasamy College of Arts and Science (Autonomous), Tiruchengode-637215*

Abstract:

In this paper we have interest to discuss about the various nanocomposite films consisting of either metal-metal oxide, polymers mixed with metals or metal oxides have been synthesized and investigated. In this types of nanocomposite films suitable for gas sensors application, and the unique gas sensing properties of nanocomposite films. In this review, we briefly summarize the characterization such as XRD, UV-Vis, FTIR, FESEM and TEM. Highlight the current developments in this new area of research including the fabrication methods.

Keywords: *Gas sensors, Metal oxides, Nanocomposite, Polymers.*

Presenting author:

E-mail: *seismickarthi@gmail.com*

Tel.: ***+91- 9865650753***

Recognition and Biological Applications of Metal Nanomaterials

R. Ramesh* and P.Palaniappan

Department of Biochemistry, J.J.College of Arts and Science (Autonomous), Sivapuram, Pudukkottai- 622 422, Tamilnadu, India

Abstract

The emergence of nanotechnology in the last three decades has changed the perception of drug discovery and development by opening many hidden doors in disease pathophysiology and treatment options. Nanotechnology deals with submicroscopic particles with at least one dimension less than 100 nm. The adage, "small is the new big", rightly fits to describe the role played by nanotechnology based delivery systems in modern-day therapeutics. In recent years, the use of Metal Nanomaterials in new technologies has drastically increased owing to their superior properties of smaller particle size upto the nanometer range compared with those of bulk metals. Among various Nanomaterials, Metal Nanomaterials is one of the most applied because Nanomaterials are expected hopefully to transform the diagnosis of cancer and treatment. Metal Nanoparticles s are important materials that have been studied extensively because of their unique electrical, optical, and biological properties, and these NPs have been applied to biosensing, catalysis, drug delivery, imaging, nanodevice fabrication, medicine and biomedical research. Hence, present Study highlights the applications of Metal nanoparticles in Biological research. Finally, the goal of our research is to contribute to our society through nanomaterial innovations (in the form of Metal Nanomaterials) for Biological applications.

Keywords: *Nanomaterials; Biological properties; Medicine; innovations; Applications.*

Presenting author:

E-mail: *rameshaquatech@gmail.com*

Synergistic effect of adsorption and photocatalytic efficiency of methylene blue by Ti doped SnO_2 loaded on corn cob activated carbon

[1*]Ragupathy S[*], [1,2] **Ramamoorthy,** [1]Sakthi D and [1]Arun V

[*1]*Department of Physics, ERK Arts & Science College, Erumiyampatti, Dharmapuri -636 905, Tamilnadu, India.*

[2]*Department of Physics, Periyar University, Salem – 636 011, Tamilnadu, India.*

Abstract

In this present work, the synthesis of Ti doped SnO_2 nanoparticles (Ti: SnO_2 NPs) and loaded on corn cob activated carbon (Ti: SnO_2/CCAC) using chemical precipitation method. The synthesized materials were characterized by XRD, UV-vis DRS, PL, FTIR, FE-SEM, EDS, TEM and BET analysis. The photocatalytic activities of the Ti: SnO_2 NPs and Ti: SnO_2/CCAC was evaluated by the degradation of methylene blue (MB) in an aqueous solution under sun light irradiation. The optimum removal efficiency of MB onto adsorbent was determined as 96% at pH 6.5, 2 mg catalyst dose, 30 mg/L initial MB dye concentration and 120 min irradiation time. The results showed that the Ti: SnO_2/CCAC has exhibited higher photocatalytic activity than unloaded SnO_2 under sun light irradiation and then highest rate constant value of Ti: SnO_2/CCAC sample.

Keywords: *SnO_2, Activated carbon, Methylene blue, Photocatalytic.*

Presenting author:

E-mail: *ragupathymsc@gmail.com*

Tel: *+91-9942166081*

Structural, optical, morphological and photocatalytic properties of ZnO loaded on cotton stalk activated carbon

[1*]Ragupathy S, [2, 3]**Nithya R,** [1]Sakthi D and [1,3]Arun V

[1]Department of Physics, ERK Arts & Science College, Erumiyampatti, Dharmapuri -636905, Tamilnadu, India.*

[2] Department of Physics, Arignar Anna Govt. Arts College, Vadachennimalai, Attur, Tamilnadu, India.

[3] Department of Physics, Periyar University, Salem – 636 011, Tamilnadu, India.

Abstract

This paper reports on structural, optical, morphological and photocatalytic properties of unloaded and ZnO loaded on cotton stalk were prepared by the chemical precipitation method. The product material were characterized using X-ray diffraction (XRD), diffuse reflectance spectroscopy (DRS), photoluminescence (PL), field emission scanning electron microscopy, energy dispersive x-rays (FE-SEM with EDX), high resolution transmission electron microscope (HR-TEM), Fourier transform infrared spectroscopy (FT-IR), and N_2-sorption BET surface area analysis. The photocatalytic activities of the ZnO and ZnO/CSAC were evaluated in the degradation of brilliant green (BG) under sun light irradiation. It was concluded that the higher photocatalytic activity in ZnO/CSAC was due to parameters like band-gap, hydroxyl groups, surface area and porosity of the catalyst. The rate constant value was also described by the pseudo-first-order kinetic models.

Keywords: *ZnO NPs, Activated carbon, Brilliant green, Photocatalytic activity.*

Presenting author:

E-mail: *ragupathymsc@gmail.com*

Tel: *+91-9942166081*

Synthesis and characterization of CuO loaded on Pongamia pinnata shell activated carbon for photocatalytic applications

***Ragupathy S** and Suvathika M, Sakthi D and Arun V

**Department of Physics, ERK Arts and Science College, Erumiyampatti, Dharmapuri -636905, Tamilnadu, India.*

Abstract

CuO nanoparticles were synthesized and loaded on Pongamia pinnata shell (CuO/PPSAC) using by the chemical precipitation method and its photocatalytic activity was evaluated by photodegradation of brilliant green (BG) under sunlight irradiation. The synthesized products were characterized by X-ray diffraction (XRD), UV–Visible, diffuse reflectance spectroscopy (UV-vis, DRS), photoluminescence (PL), fourier transform infrared spectroscopy (FT-IR), and field emission scanning electron microscopy (FE-SEM) with energy dispersive X-ray (EDX) for their structures, band gaps, emission, hydroxyl groups, morphology and elemental chemical composition. The various experimental parameters like amount of catalyst and contact time for efficient dye degradation of BG were investigated. They CuO loaded on PPSAC revealed that the exhibit higher photodegradation efficiency via synergistic effect. This result is attributed to the increase of the separation of photogenerated electron-hole pairs on the surface of CuO loaded on PPSAC.

Keywords: *CuO/AC, Brilliant green, Activated carbon, Photocatalytic activity.*

Presenting author:

E-mail: *ragupathymsc@gmail.com*

Tel: *+91-9942166081*

Influence of Zn doping on the electrochemical capacitor behavior of CuO nanoparticles

***Ragupathy S**, Jayasri M, Sakthi D and Arun V

Department of Physics, ERK Arts and Science College, Erumiyampatti, Dharmapuri -636905, Tamilnadu, India.

Abstract

We suggest a simple chemical precipitation for the synthesis of pure and different level of Zn doped CuO nanoparticles as electrode for supercapacitor. The structure and functional groups of the products material were characterized by X-ray diffraction (XRD) and Fourier transform infrared spectroscopy (FTIR), respectively. The morphologies of the pure and Zn doped CuO were analyzed by a field emission scanning electron microscope (FE-SEM). The surface areas and pore volumes of the products were determined from N_2 adsorption–desorption isotherm curves and the results reveal that CuO doped with Zn yields a smaller particle size, higher specific surface area, and a larger pore volume than those of pure CuO. The results of the capacitance behavior reveal the improved capacitance performance for CuO on Zn doping. Especially, among the doped products, CuO doped with 0.10 M Zn gives the high specific capacitance.

Keywords: *CuO NPs, Electrochemical, Supercapacitor.*

Presenting author:

E-mail: *ragupathymsc@gmail.com*

Tel: *+91-9942166081*

Synthesis and characterization of ZnS loaded on Pongamia pinnata shell activated carbon and photocatalytic activity on Rhodamine B dye under sunlight irradiation

***Ragupathy S**, Sathiyapriya S, Sakthi D and Arun V

Department of Physics, ERK Arts and Science College, Erumiyampatti, Dharmapuri -636905, Tamilnadu, India.

Abstract

Zinc sulfide (ZnS) NPs were synthesized and loaded on Pongamia pinnata shell activated carbon (ZnS/PPSAC) using by a chemical precipitation method and its photocatalytic activity was evaluated by photodegradation of Rhodamine B (RhB) under sunlight irradiation. The synthesized products were characterized by X-ray diffraction, UV–Visible spectroscopy, photoluminescence, Fourier transform infrared spectroscopy, scanning electron microscopy with energy dispersive X-ray and N2-sorption BET surface area for their structures, band gaps, emission, hydroxyl groups, morphology and specific surface area. The various experimental parameters like amount of catalyst and contact time for efficient dye degradation of RhB were investigated. They ZnS/PPSAC revealed that the exhibit higher photodegradation efficiency via synergistic effect. This result is attributed to the increase of the separation of photogenerated electron–hole pairs on the surface of ZnS/PPSAC.

Keywords: *ZnS/AC, Rhodamine B, Photocatalytic activity.*

Presenting author:

E-mail: *ragupathymsc@gmail.com*

Tel: *+91-9942166081*

Structural Properties and Morphological analysis of NiS nanoparticles

S.Cholan*, G.Sivakumar

PG and Research Department of Physics Sri Vidya Mandir Arts & Science College, Uthangarai, Krishnagiri - 636 902

Abstract

In this study copper sulfide nanoparticles were successfully prepared at 400°C. The particles were characterized structure, optical and morphological feature of copper sulfied nanoparticle was investigation. The presence of sharp peaks in the XRD patterns indicates the good crystalline structure of samples obtained. The pure CuS spectrum shows an absorption edge at approximately 263 nm, which is in good agreement with the intrinsic energy band gap of CuS at 2.28 eV. The emission spectrum shows two broad peaks around 445nm is blue shift and 546 nm red shift. The peaks were attributed to emissions from defect levels. The obtained FT-IR results are in good agreement with the XRD analysis and no alkoxy groups are present in the samples. Finally the SEM images are attributed at different magnification, which clealy reveal that CuS nanoparticle are fine smooth and spherical in shape and uniformly distributed. The sizes of the particles are in the range of 30-40 nm.

Keywords: *copper sulfide NPs, structure, Optical and Morphological.*

Presenting author:

E-mail: cholanmsc@gmail.com

Energy transfer mechanism in the form of dark soliton in discrete model of microtubules with Morse potential

E. Parasuraman*

Department of Physics, Indian Academy of Degree College - Autonomous, Hennur Cross, Kalyan Nagar, Bangalore- 560 043, Karnataka, India

Abstract

We study the dynamics of soliton propagation along MT with the effect of Morse potential. We formulate the Hamiltonian with Morse potential and it is governed into the nonlinear differential equation with the help of Hamilton's equation. By the use of rotating wave transformation, obtain the standard form of discrete nonlinear Schrödinger equation. We employ the discrete Jacobi elliptic function method to the discrete nonlinear Schrödinger equation and obtain the exact solution. When 1 ml in the exact solution, the solution as changed into hyperbolic solution, in which we can analyze the role of Morse potential on microtubule dynamics. From graphical figures, we can also understand the evolution of a dark soliton in microtubules with the presence of Morse potential.

Presenting author:

E-mail: *nldparasu@gmail.com*

Green Synthesis of Copper Nitrate ($CuNO_3$) Nanoparticles Using *Momordica Charantia* Leaf Extract Targeting MCF-7 Breast Cancer Cell: *In Vitro* Cytotoxicity

P.Palaniappan, R.Jayapriya and R. Ramesh

Department of Biochemistry, J.J.College of Arts and Science (Autonomous), Sivapuram, Pudukkottai- 622 422, Tamilnadu, India

Abstract

An eco-friendly green approach was proposed to synthesize stable nano materials are utilized in the pharmaceutical field which can be developed into novel agents with less size effects much cost effective process cytotoxic copper nitrate leaf extract and *In- vitro* study of anticancer activity against Breast cancer cell line MCF-7 showed significant activity CuNPs. The physiochemical, crystalline optical and morphological properties of CuNPs were characterized using the UV-Vis, FT-IR, XRD, SEM reveals the presence of major functional groups over the surface of Nano materials. The MTT assay, In vitro noticeable anti- cancer activity of Cu- NP on MCF-7 human breast cancer cells in a dose dependent manner IC50 value 100 µg/ml further move *M. charantia* copper nitrate CuNPS were found to be biocompatible in comparison to *M. charantia* LE. In this study *M. charantia* LE and biosynthesized Cu-NPs found to be potent agent against tested human Breast cancer cell, and antibacterial activity it is suitable CuNPs Nano drug formulation for biomedical application.

Keywords: M. Charantia, Cupper nitrate, SEM, Anticancer activity, MCF-7, MTT assay, Nanoparticle

Presenting author:

E-mail: *biopalani82@gmail.com*

A $CdS/CoTiO_3/ZnO$ Ternary Nanocomposite As Visible Light Driven Photocatalyst With Enhancement Photocatalytic Efficiency

G. Divya[1] A. Muthamilarasu[1] D. Sakthi[2] and **S. Sivakumar[1*]**

[1]*Department of Chemistry, E. R. K Arts and Science College, Dharmapuri , INDIA*

[2]*Department of Physics, E. R. K Arts and Science College, Dharmapuri, INDIA*

Abstract

ZnO as a promising photocatalyst has gained much attention for the removal of organic pollutants from water. However, the main drawbacks of the relatively low photocatalytic activity and high recombination rate of photoexcited electron-hole pairs restrict its potential applications. Promoting the spatial separation of photoexcited charge carriers is of paramount significance for photocatalysis, because the difference in the band positions make the potential gradient at the composite boundary. In this work, binary CdS/ZnO and $CoTiO_3$/ZnO are first prepared by dispersion method, then decorated with ZnO nanoparticles to construct $CdS/CoTiO_3$/ZnO ternary nanocomposites. For this reason, the $CdS/CoTiO_3$/ZnO ternary nanocomposites was effectively designed and analyze for the crystalline structure, light absorption, photoexcitation behavior and surface morphological properties by X-ray diffraction, diffuse reflecta nce UV/visible absorption spectroscopy, Photoluminescence spectroscopy and scanning electron micrography rspectively. The photocatalytic activity was examined by degradation the dye solution spectrophotometrically. The results of photocatalytic degradation tests indicated that the $CdS/CoTiO_3$/ZnO ternary composites are much higher than those of bare CdS, $CoTiO_3$, ZnO and any binary composites such as $CoTiO_3$/ZnO and ZnO/CdS. The enhanced activity could be attributed to the drop electron transfer from CdS to ZnO to $CoTiO_3$ through the interfacial potential gradient in the ternary hybrid conduction bands. Such a cascade electron transfer in the hybrid structure facilitated the charge separation and retarded the charge pair recombination. The enhanced electron transfer of $CdS/CoTiO_3$/ZnO ternary composites was also applicable to degrade other reactive dyes.

Keywords: *$CdS/CoTiO_3/ZnO$, Ternary Heterojunctions, Reactive Orange 30, Photocatalytic Efficiency and Natural Sunlight*

Presenting author:

E-mail: *sivachem84@gmail.com*

Synthesis, Structural Designing, Characteraization And Evoluation Of Photocatalytic Efficiency On TiO_2/ZnO/CdS in Presence Of UV-Visible Light As Source

A.Muthamilarsu[1], M. Sivakumar[1] P. Vadivel[2], S. Parvathy[3] and **S. Sivakumar[1*]**

[1]PG & Research Department of Chemistry, E. R. K Arts and Science College Dharmapuri-636905

[2]PG & Research Department of Chemistry, Salem sowdeswari college Salem-636010, INDIA

[3]PG & Research Department of Chemistry, Government Arts College, Salem-7, INDIA

Abstract

The ternary heterojunction composites have been evaluated from their activity in the degradation of Reactive Blue 160 in the presence of UV-visible light. The mineralization of reactive dyes with triazine groups has been reported to be more difficult in most treatment methods. However, at higher concentrations, the dye solutions, especially chlorotriazine dye solutions transmit only very small portion of photons to reach the photocatalyst surface. Hence, degradation of these dyes at higher concentration levels is more difficult by using single photocatalysts. However, in most cases combination of two or more photocatalyst are found to be more efficient than the individual photocatalyst for the degradation of higher concentration dyes. Hence, TiO_2/ZnO/CdS ternary composites (TZC) showed higher photocatalytic activity than that of CdS, TiO_2, ZnO, CdS/TiO_2 and CdS/ZnO. (TZC) ternary composites show the favourable photocatalytic activity at pH 3. All the photocatalysts shows anatase crystalline phase was confirmed by X-Ray Diffractional Analysis. The TZC ternary photocatalyst shows an absorption threshold extended into the visible region and also has smaller particle size compared to binary and single photocatalytic system.

Presenting author:

E-mail: *sivachem84@yahoo.com*

Strontium and Nitrogen-Co doped TiO_2 With Enhanced Photocatalytic Degradation of Reactive Orange 30 Under Natural Sun Light Irradiation

M. Sivakumar[1, 2] **M. Ravishankar*2**, E. Krishnan[2] and S. Sivakumar[1]

[1]*Department of Chemistry, E. R. K Arts and Science College, Harur , INDIA*

[2] *Department of Chemistry, Rajah Serfoji college of Arts and Science, Thanjur, INDIA*

Abstract

The photocatalytic activity of Sr, N-co doped TiO_2 photocatalysts was investigated by the degradation of Reactive Black 5 (RB 5) under natural sunlight irradiation. A series of Sr, N-co doped TiO_2 photocatalysts with different dopant concentrations (0.001 M%, 0.003 M %, 0.005 M %, 0.007 M %, and 0.009 M %) were synthesized by sol-gel route. Initially, photocatalytic activity of the pure TiO_2 was hindered due to its poor surface properties and low utilization of visible light. To minimize these bottle neck drawbacks of TiO_2 photocatalyst, the doping treatment of Strontium and Nitrogen. The photocatalytic activity of Sr, N-co doped TiO_2 photocatalysts was remarkably higher than that of the as-prepared sample. The highlighted photocatalytic properties of Sr, N-co doped TiO_2 were confirmed by X-ray powder diffraction (XRD), Scanning electron microscopy (SEM), UV-visible diffused reflectance spectroscopy (UV-DRS) and Photoluminescence spectra (PL). 0.005% Sr, N-co doped TiO_2 has photostability and long durability.

Keywords: *Sr, N-Co doped TiO_2, sol-gel route, Photocatalytic Degradation, Reactive Orange 30 and Natural Sun Light*

Presenting author:

E-mail: *ravishankar1in@yahoo.co.in*

Enhanced Photocatalytic Degradation Efficiency of W, N-Co doped TiO_2 Over Reactive Black 5 Under Natural Sun Light Irradiation

E. Krishnan[2], **M. Ravishankar*[2]** M. Sivakumar[1, 2] and S. Sivakumar[1]

[1]*Department of Chemistry, E. R. K Arts and Science College, Harur , INDIA*

[2] *Department of Chemistry, Rajah Serfoji college of Arts and Science, Thanjur, INDIA*

Abstract

The photocatalytic activity of W, N-co doped TiO_2 photocatalysts was investigated by the degradation of Reactive Black 5 (RB 5) under natural sunlight irradiation. A series of W, N-co doped TiO_2 photocatalysts with different dopant concentrations (0.002 M%, 0.004 M %, 0.006 M %, 0.008 M %, and 0.01 M %) were synthesized by sol-gel route. The pure TiO_2 was low photocatalytic activity, due to its poor surface properties and low utilization of visible light. To minimize these bottle neck drawbacks of TiO_2 photocatalyst, the doping treatment of W and N on TiO_2. The photocatalytic activity of W, N-co doped TiO_2 photocatalysts was remarkably higher than that of the as-prepared sample than that of pure TiO_2. The highlighted photocatalytic properties of W, N-co doped TiO_2 were confirmed by XRD, SEM, UV-DRS and PL. 0.008% W, N-co doped TiO_2 has photostability and long durability.

Keywords: *W, N-Co doped TiO_2, sol-gel route, Photocatalytic Degradation, Reactive Black 5 and Natural Sun Light*

Presenting author:

E-mail: *ravishankar1in@yahoo.co.in*

Enhancement Photocatalytic Dye Degradation Efficiency of Green Ternary Nano Composite $Fe_2O_3/TiO_2/CdS$ Over Reactive Azo Dye Under UV-Visible Light Irradiation

R. Thambidurai[1, 2] D. Sakthi[3] and **S. Sivakumar*[1]**

[1]*Department of Chemistry, E. R. K Arts and Science College, Harur , INDIA*

[2] *Sri Vidya mandir Arts & Science College,Utahgarai, INDIA*

[3]*Department of Physics, E. R. K Arts and Science College, Harur , INDIA*

Abstract

Green synthesized parent photocatalyst has photocatalytic behavior than that of other classical poutes. Heterojunction composites such as CdS/TiO_2 and Fe_2O_3/TiO_2 were prepared in a simple dispersed method from the metal oxides synthesized from sol-gel method. This synthesized wide band gap semiconductors such as TiO_2 there in anatase phase respectively. And the narrow band gap semiconductors like Fe_2O_3 were present in ilmenite phase structure. The heterojunction composites have been evaluated from their activity in the degradation of Reactive Blue 160 in the presence of UV-visible light. From the degradation result, $Fe_2O_3/TiO_2/CdS$ composites (FTCS-3) showed higher photocatalytic activity than that of Fe_2O_3/TiO_2 and CdS/TiO_2 heterojunctions shows the favourable photocatalytic activity at pH = 3. The mineralization of reactive dyes with triazine groups has been reported to be more difficult in most treatment methods. However, at higher concentrations, the dye solutions, especially chlorotriazine dye solutions transmit only very small portion of photons to reach the photocatalyst surface. Hence, degradation of these dyes at higher concentration levels is more difficult in the photocatalytic process. However, in most cases combination of two or more advanced processes are found to be more efficient than the individual processes for the degradation of higher concentration dyes. Hence, the optimized heterojunction composites like FTCS-3 composites have been used for the degradation of Reactive Blue 160.

Keywords: *$Fe_2O_3/TiO_2/CdS$ composites, sol-gel route , Photocatalytic Degradation, Reactive Blue 160 and Natural Sun Light*

Presenting author:

E-mail: *sivachem84@gmail.com*

A study of photocatalytic degradation of $CdS/NiTiO_3/TiO_2$ ternary composites: Structural designing, spectral characterization and Photocatalytic Degradation study

S. Vadivel[1, 2], **J. Dharmaraja[1*]**

[1]*Department of Chemistry, Arignar Anna Government Arts and Science College, Attur, INDIA*

[2]*Government Higher Secondary School, Athanur, Namakkal, INDIA*

Abstract

In this work, binary $NiTiO_3/TiO_2$ is first prepared by dispersion method, then decorated with CdS nanoparticles to construct $CdS/NiTiO_3/TiO_2$ ternary cmposites. The crystal structure, surface morphology, optical properties and photoexcitation behavior were characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), ultraviolet-visible spectrophotometer and photoluminescence study (PL). The $CdS/NiTiO_3/TiO_2$ ternary cmposites exhibited a greater enhancement in photocatalytic activity compared with CdS/TiO_2 or $NiTiO_3/TiO_2$ binary composite. The degradation rate of $CdS/NiTiO_3/TiO_2$ ternary cmposites towards reactive black 5 (RB 5) within 70 min was 94%, indicating the efficient and selective degradation characteristics. The results show that the $CdS/NiTiO_3/TiO_2$ ternary cmposites holds great potential in removing of textile effuluents.

Keywords: *$CdS/NiTiO_3/TiO_2$, Ternary Heterojunctions, Reactive Black 5, Photocatalytic Efficiency and Natural Sunlight*

Presenting author:

E-mail: *jagandharma@yahoo.co.in*

Microwave assisted synthesis of mixed sulphide nanostructures and its renewable energy applications

A. Sathya priya[a] and **R.Jude vimal michael**[*]

Department of Chemistry, Sacred Heart College(Autonomous), Tirupattur, Vellore Dist, 635601

Abstract

Mixed sulphide is one of the well-know inorganic material and the formulas are ZnS-CdS. It is one of the semiconductors discovered that has shown the remarkable properties that can be exploited for variable applications including field emitters, electroluminescence, electro catalyst, biosensors. Dye-sensitized solar cell (DSSCs) are the most extensively system for the conversion of solar energy into electrical energy and it is very cost effective. The ZnS nano particles can be used for Photocatalytic application, Hydrogen generation for renewable energy application. In this research work, the synthesis of ZnS nanoparticles by using thermal decomposition of the complex under microwave irradiation was attempted along with monitoring the control of surface morphology and the crystal structure. It has a hexagonal structure. The obtained powder gave nano structure ZnS with high degree of crystallinity. The as synthesized powder is to be tested further for this FT-IR, XRD, UV-DRS and SEM.

KeyWords: *ZnS, DSSC, hydrogen generation*

Presenting author:

E-mail: *sathya130694@gmail.com,*

Lithium Bis(Oxalato) Borate Mixed LiPF6 Electrolyte Material In Lithium Ion Battery

G.Balaji, **M.Selvapandiyan***

Department of Physics, Periyar University PG Extension Centre, Dharmapuri 636 701.

Abstract

Lithium ion battery have suitable candidate for various applications such as mobile phone, storage devices, clock and etc. 0.2 M percentage of Lithium bis(oxalato) borate (LiBOB) added $LiPF_6$ electrolyte materials was prepared by sol gel method. The prepared materials were analyzed by PXRD, SEM, TGA/DTA analysis. Crystal system and crystallite size of the material was analyzed by PXRD studies. Thermal stability of the prepared materials was higher than reported values which were confirmed by TGA. Particle size and morphology of the material was investigated by SEM.

Keywords: Lithium BIS(oxalate)borate, Electyrolyte; LiPF6

Presenting author:

E-mail: *mselvapandiyan@rediffmail.com*

Lithium Hexafluoro Phosphate Electrolyte for Battery Applications

V.Velangkanni, **M. Selvapandiyan***

Department of Physics, Periyar University PG Extension centre, Dharmapuri-636701

Abstract

Lithium hexafluoro phosphate [$LiPF_6$] is the most used electrolyte salt in commercial Li-ion batteries [LIB]. Lithium ion battery has high performance, excellent stability, low cost, safety, better energy density and high columbic efficiency. 0.2 M lithium hexafluoro phosphate [$LIPF_6$] was dissolved in ethylene carbonate and dimethyl carbonate in the equi molar ratio [1: 1] from sol – gel method at 80°C. Structure and particle size of the materials was analyzed by XRD. Conductivity of the material is increases by increasing temperature. Structural morphology of the material was carried out by SEM.

Keywords: Sol-gel method, Electyrolyte; $LiPF_6$

Presenting author:

E-mail: *mselvapandiyan@rediffmail.com*

Improving the Dyeability of silk Fabrics by using Chitosan with Natural Dye from Flowers of *Landana Camara Linn*

P.Saravanan*

Department of Chemistry, Kings College of Engineering, Punalkulam, Pudhukottai,Tamil Nadu, India-613 303

Abstract

Recently people have shown greater interest in the use of natural dyes in textile processing. This is because of people's increasing awareness of the environmental effects of water pollution and waste disposal. In addition, there are problems of toxic in and allergic reactions associated with synthetic dyes, while natural dyes exhibit fewer problems of toxicity, better biodegradability, and more compatibility with the environment. The study examined the influence of chitosan to improve dye absorption on silk farbric using *Landana Camara Linn.* In present study, the silk fabric was treated with chitosan at different concentrations to find a suitable concentration on dye ability with natural dye from flowers of *Landana Camara Linn.* The influence of dyeing methods with mordants, i.e. pre-mordanting, post-mordanting and simultaneous mordanting was determined. The light and wash fastness of chitosan treated samples were measured compared with untreated samples. Chitosan-treated silk fabric improved both dyeability and fastness compared with untreated silk fabric. The silk fabrics treated with chitosan not only provided better depth of shade but also provided better wash fastness and light fastness than those of the untreated fabrics. The use of different mordants and mordanting methods affected the dye shade and depth of shade differently on the dyed fabrics both with and without chitosan. The range of colour developed on dyed materials were evaluated in terms of (L*a*b*) CIELAB coordinates and the dye absorption on the silk was studied by using K/S values.

Keywords: *Extraction, Natural dye, Ficus Religiosa Linn, chitosan, mordant and silk fabric*

Presenting author:

E-mail: *drps1977@gmail.com.*

Tel: *+91-988436202.*

Kinetic Studies on the RemovalIron (III) onto Acid Activated Vitex Negundo Stem

S.Udayakumar[1*] and K.Kavitha[2]

[1*]*Department of Chemistry, Kings College of Engineering, Pudukkottai, Tamil Nadu, India-613 303*

[2]*Department of Chemistry, S.T.E.T Women's College, Mannargudi, Tamil Nadu, India-614 001*

Abstract

The present study is on adsorption of Fe(III) by Acid Activated Vitex Negundo Stem. It uses batch adsorption techniques. The influence of contact time, initial concentration, dosage of adsorbent and effect of solution pH were investigated. The isotherm studies of R_L values showed that the adsorption process was favorable. Thermodynamic parameters such as ΔH°, ΔS° and ΔG° were evaluated. The data indicate that, the adsorption was spontaneous and is an endothermic nature. Adsorption kinetics was tested with pseudo- second –order, Elovich model and intra – particle diffusion models. Kinetic studies indicate an adsorption pseudo – second –order reaction. This study shows that intra – particles played a major role in the adsorption of Fe(III) ions mechanism. The Acid Activated VitexNegundo Stem has high adsorption capacity and adsorption rate for the removal of Fe(III) ions from aqueous solution.

Keywords: *Adsorption, Iron (III) ions, kinetics, Vitex Negundo Stem, Thermodynamics*

Presenting author:

E-mail: *udaya_suri@yahoo.com*

Tel: *+91 9787852496*

Sand Storage Technology with Lithium-ion Coated Batteries

S. Ambalatharasu*

Department of Physics, Kings College of Engineering, Pudukkottai, Tamil Nadu, India-613303

Abstract

Solar cell is an alternative source for utilizing renewable natural resource, comparatively cost of production is more than energy utilized. Even lithium-ion battery uses silicon to achieve some better performance than graphitebatteries. By using sand, it can be purified,powdered then ground with salt and magnesium before being heated to remove oxygen resulting in pure silicon. Which increase life span of batteries by more than three times. Silanano tech startup thatbringing this technique in Bayerische Motoren Werke for complete power backup battery related sensors and operations include remote by controlling complete unit. It can assure that efficiency will be increased by 40% to 60% by our clinical test with coated sand battery. By testing with smartphones, it implements four days of complete rest hour usage.Also, its specially proposed to Apple operating systemios for augmented reality based technology in futured A15 chipset technology.

Presenting author:

E-mail: *sambalatharasu@gmail.com*

Tel: *+91 94451 60783.*

A Study on immersion time and Inhibition efficiency of carbon steel in 1N HCl using polythiophene derivatives

V. Suresh Kumar*

Department of Chemistry, Kings College of Engineering, Pudukkottai, Tamilnadu, India-613 303

Abstract

New and effective polymeric corrosion inhibitors, namely, Polythiophene and some of its acid derivatives (PTh, PTh-CA, PTh-p-TSA, PTh-AQSA and PTh-β-NSA) were prepared by dilute polymerization method. The synthesized inhibitors were characterized by FT-IR and SEM studies. Its influence on corrosion inhibition of mild steel in 1N HCl solution in different immersion time at 30^{o}C was studied using weight loss method. The inhibition efficiencies of the polythiophene derivatives were found out at various concentrations to find out the optimum inhibitive concentration and immersion time of these inhibitors. The polymeric inhibitors such as PTh, PTh-CA, PTh-p-TSA, PTh-AQSA and PTh-β-NSA under study behave as good and efficient inhibitors for the corrosion of carbon steel in 1N HCl solution. In the weight loss studies for a period of 3 h of immersion time, the maximum inhibition efficiency obtained for PTh was 85.2% at 900 ppm, PTh-CA 88.7% at 700 ppm, PTh-p-TSA 92.5% at 700 ppm, PTh-AQSA 95.2% at 700 ppm, PTh-β-NSA 95.2% at 700 ppm. Among the five polythiophene derivatives studied, the maximum inhibition efficiency was found in both PTh-AQSA and PTh-β-NSA which showed inhibition efficiency of more than 95% at 700 ppm.

Keywords: *Corrosion inhibitors, Mild steel corrosion, Polythiophene, Polythiophene-Citric acid, Polythiophene Anthraquinone sulphonic acid, Polythiophene-β-Naphthol sulphonic acid, Polythiophene-p-Toluene sulphonic acid.*

Presenting author:

E-mail: v_suri1969@yahoo.com

Tel: *+91-9443900509*

Structural, Magnetic and Electrochemical Properties of Alkaline Lithium Ions Doped NiO Nanocrystals

K.Sathishkumar*

Department of Physics, Annai College of Arts and Science, Kovilacheri, Kumbakonam, Tamil Nadu-612 503, India.

Abstract

Nanocrystalline NiO and NiO doped with different levels of Li^+ ions are synthesized through a simple chemical precipitation method. The effect of Li^+ doping on structural, morphological and optical properties was investigated. XRD studies reveal that all the products exhibit a cubic phase of NiO. The effect of Li^+ doping was observed to have a strong influence on the surface morphology of NiO nanocrystals. The VSM measurements of the doped products show a room temperature ferromagnetism on the higher level of doping. When compared to undoped NiO, all the doped products show a lower value to specific capacitance.

Keywords: *simple chemical precipitation, NiO, simple chemical precipitation, specific capacitance*

Presenting author:

E-mail: *ksphy2009@gmailcom*

Super paramagnetic iron oxide nanoparticles (SPIONS)

M.Anbarasu*[1]and K.Balamurugan[2]

[1]PG and Research Department of Physics, Morappur Kongu College of Arts and Science, Morappur, TamilNadu, India-635 305.
[2]Department of Physics, Arignar Anna Government Arts and Science college, Villupuram, TamilNadu, India-605 602.

Abstract

Fe_3O_4 (Magnetite) nanoparticlees were successfully synthesized via a chemical co-precipitaion method and characterized by X-ray diffraction, Fourier transform infrared (FTIR) spectroscopy,Thermogrvimetric (TG) analysis, Transmission electron microscopy (TEM) and magnetic properties (using vibrating sample magnetometer). The synthesized iron oxide nanoparticle are obtained 14nm by x-ray diffraction technique and confirm with TEM analysis. Magnetic properties of synthesized iron oxide nanoparticles is Ms = 58emu/g and lower coercivity Hc= 30e. The super paramagnetic iron oxide nanoparticles (SPIONS) are used to biomedical application such as MRI contrast agent.

Keywords: *Chemical co-precipitation, Magnetite, X-Ray Diffraction.*

Presenting author:

E-mail: *anbuarasum017@gmail.com*

Morphological and structural characterization of ZnO/SnO_2 core-shell nanoparticles

N.Siva[1, 2]*, N.Kannadasan[1], D.Sakthi[1], V.Arun[1, 3],

[1]*Department of Physics, E.R.K. Arts and Science College, Erumiyampatti, Dharmapuri 608 002, Tamil Nadu, India*

[2]*Department of Physics, Periyar University, Periyar Palkalai Nagar, Salem, Tamil Nadu 636011, India*

[3]*Department of Energy studies Periyar University, Periyar Palkalai Nagar, Salem, Tamil Nadu 636011, India*

Abstract

Core-shell type nanoparticles with ZnO core and zinc oxide shells was prepared and characterized by FESEM, XRD. The influence of the structure of the ZnO shell and the morphology of nanoparticle was evaluated. An X-ray diffraction structure study shows the presence of thin SnO_2-like shells around the nanoparticles at low Sn levels. In the case of ZnO cores, SnO_2 nanocrystals are formed at high Sn/Zn ratios (0.5 mole %). Scanning electron microscopy studies show that Zn modification of ZnO nanoparticles changes the morphology from a compact mesoporous structure to a less dense macroporous structure.

Keywords: *Core-Shell, SnO_2, FE-SEM, mesoporous*

Presenting author:

E-mail: *nsivaphy@gmail.com*

Effect of structural, optical, morphological and NLO studies of Ba-TiO_2 nanoparticles synthesized by sol-gel process

S.Mugundan*, S.Bhuvaneswari, S.Pavithra, C.Revathi

PG and Research Department of physics, Sri Vijay Vidyalaya College of Arts and Science, Dharmapuri-636807

Abstract

The pure and barium doped titanium dioxide (Ba-TiO_2) nanoparticles (NPs) were synthesized by sol-gel method in room temperature and calcined at 500°C and their structural (XRD), Functional (FT-IR), morphological (SEM, TEM, EDX), optical (UV-vis (DRS), PL) and NLO were characterized. XRD pattern shows that the tetragonal (t)-TiO_2 structure was observed. The functional groups were present in the prepared NPs by FTIR. The band gap energy (Eg) of the prepared Ba-TiO_2 NPs was calculated from DRS method. The Ti-O and Ba elements presence in the EDX spectrum. The various morphologies were observed by SEM. From the TEM images, the particles size was increased with Ba dopant. The SHG efficiency of 8 wt.% Ba-TiO_2(0.44 mV) is less than that of pure TiO_2 observed from NLO study.

Keywords: *TiO_2, spherical uniform structure, SHG Efficiency.*

Presenting author:

E-mail: *mugugum@gmail.com*

Tel: *+91-9600689899*

Synthesis and characterization of ZnO nanoparticles through a chemical precipitation method

S. Mugundan*

PG and Research Department of physics, Sri Vijay Vidyalaya College of Arts and Science, Dharmapuri-636807

Abstract

In this paper, highly dispersed Zinc Oxide (ZnO) nanoparticles have been successfully synthesized in Deionised water mixed solvent by a chemical precipitation method. The prepared ZnO nanoparticles were characterized by high-resolution transmission electron microscopy (HRTEM) and X-ray diffraction (XRD). Several kinds of ZnO particles with different shapes were obtained including particle-like, spherical-like, spindle-like and rod-like ZnO particles. The effects of processing parameters on the size and shape of ZnO particles such as the volume ratio of water, the increasing temperature of NaOH. It is found that higher volume ratio and water, higher adding temperature of NaOH and higher molar ratio of Zinc and O result in smaller size of ZnO particles. The nucleation and growth kinetic of the resulting ZnO particles were also discussed.

Keywords: *Zinc nanoparticles, crystalline size, FT-IR, spherical uniform structure, SHG Efficiency.*

Presenting author:

E-mail: *mugugum@gmail.com*

Tel: *+91-9600689899*

Synthesis and characterization of Ni^{2+} doped ZnO nanoparticles

N.Kannadasan[1*], N.Siva[1, 2], D.Sakthi[1], V.Arun[1, 3],

[1]*Department of Physics, E.R.K. Arts and Science College, Erumiyampatti, Dharmapuri 608 002, Tamil Nadu, India*

[2]*Department of Physics, Periyar University, Periyar Palkalai Nagar, Salem, Tamil Nadu 636011, India*

[3]*Department of Energy studies Periyar University, Periyar Palkalai Nagar, Salem, Tamil Nadu 636011, India*

Abstract

With a view of tailoring the structural, optical, and electrochemical properties of ZnO, nanocrystals of ZnO doped with different levels (0.025, 0.05, 0.75, 0.1 and 0.125 M) of nickel have been synthesized using a simple chemical precipitation method. The synthesized particles were analyzed for their structural, optical, and morphological. The results of X-ray diffraction indicate that the synthesized particles are in hexagonal wurtzite structure with average crystalline sizes in the range of 17-28 nm. The optical absorption measurements indicate the blue shift in the absorption band edge up to 0.1 M of Ni doping. The photoluminescence of Ni-doped ZnO exhibits intensity quenched UV emission as the concentration of doping increases. X-ray photoelectron spectroscopy result of Ni-doped ZnO provides the evidence that the incorporated Ni ions are in the 2+ valence state. The morphology of the products analyzed by transmission electron microscopy depicts the presence of spherical and hexagonal particles with certain degree of agglomeration and majority of them are bearing a size between 20 and 30 nm.

Keywords: *ZnO, chemical precipitation, hexagonal, agglomeration, photoluminescence.*

Presenting author:

E-Mail: *nkannadasan87@gmail.com.*

Tel: *+91-9788436117*

Biomass-derived Activated Porous Carbon from Neem Leaves for High Energy Asymmetric Supercapacitor

R.Poonguzhali[1]*

[1]PG& Research Department of Physics, Mahendra Arts and Science College (Autonomous), Kallippatti-637501 Tamil Nadu, India

Abstract

The materials which possess high specific capacitance in device configuration with low cost are the essential criteria for viable application in supercapacitors. Herein, a flexible high energy supercapacitor device was fabricated using porous activated high surface area carbon derived from neem leaves (NL) as a precursor. The NL derived activated carbon showed mesoporous nature with high specific surface area of ~1890 m^2/g. A high specific capacitance of values achieve in three electrode system configurations in aqueous electrolyte. Meanwhile, the obtained carbon material was used as the electrode material in a supercapacitor. The supercapacitor device exhibits good electrochemical performances including a high specific capacitance and good stability. This new material makes full use of neem waste to provide a useful material for energy storage.

Keywords: *Neem leaves, biomass-derived porous carbon, supercapacitors.*

Presenting author:

E-Mail: *kuzhaliphy@gmail.com.*

Tel: *+91-8973591314*

A Simple and effective method for the synthesis of CuO nanoparticles by change in NaOH concentration

T.Hemalatha*

Department of Physics, Selvam College of Technology, Ponnusamy Nagar, Namakkal, Tamil Nadu 637003

Abstract

In this article, a chemical precipitation method was developed to prepare Copper oxide nanoparticles with an average particle size of about 18-22 nm. The prepared nanoparticles were investigated using TG-DTA, XRD, FTIR, UV-Vis and SEM with EDAX. Structural analysis reveals that the CuO nanostructures have a high crystal quality with the monoclinic crystal structure and the Lattice constants a= 4.68 Å, b= 3.42 Å, c= 5.13 Å. The SEM images clearly show that the effect of NaOH on the morphologies of the as prepared nanoparticles. Optical absorption spectra exhibits the strong blue shift compared with bulk particles and the band gap increases with decreasing the size of the nanoparticles which is due to the nanosize effect. Fourier Infrared Spectroscopy (FTIR) was used to analyze presence of functional groups in the samples and the thermal analysis was done by Thermo Gravimetric analysis (TGA), which shows the stability of the samples. This method may be suitable for large scale production of nano CuO particles for the practical applications.

Key words: *Copper Oxide, Chemical precipitation, NaOH, Nanoparticles.*

Presenting author:

E-mail: *hema.phy6@gmail.com*

Structural, functional, optical, morphological and surface analyses of various metals (Zn, Fe, Mn & Sr) co-doped ceria nanoparticles

E.Gopinathan*

PG and Research Department of Physics, Shanmuga Industries Arts and Science college, Tiruvannamalai-606 603,Tamil Nadu, India.

Abstract

Nanostructures of ceria co-doped with various transition metals were prepared by a simple chemical precipitation method at 400 ºC. The structures and chemical compositions of the products were characterized by X-ray diffraction (XRD), energy dispersive spectrum (EDS) and Fourier transform infrared (FTIR) spectroscopy. The obtained products were identified to be of face-centered-cubic structure. The morphology of the doped product was analyzed by the scanning electron microscope (SEM). The room temperature PL spectra reveal that the intensity of the peak decreases due to quenching effect of doped metal ions. BET measurements exhibits low surface area and uniform pore size distribution when compared to pure ceria.

Keywords: *nanostructure, chemical precipitation, morphology, BET, EDS*

Presenting author:

E-Mail: *gopinathan6489@gmail.com*

Synthesis, spectral characterization and catalytic activity of Ni(II) and Co(II) complexes bearing salicylidine aminobenzoic acid Schiff base ligand

P. Anitha[a]* & R. Manikandan[b]

[a]*Department of Chemistry, Government College of Engineering, Salem-636011*

[b]*Department of Chemistry, Loyola College of arts and science, Mettala-Oilpatty, Rasipuram, Namakkal-636202*

Abstract

Ni(II) and Co(II) complexes containing salicylidine aminobenzoic acid ligands of general formula $[M(PPh_3)(Cl)(L)]$ (M = Ni or Co, L = monobasic salicylidine amino benzoic acid) have been synthesized from reaction of $[M(PPh_3)_2Cl_2]$ (M = Ni or Co) with salicylidine aminobenzoic acid ligands (L). The Schiff bases were prepared by condensation of amino benzoic acid with substituted salicylaldehyde. Characterization of the complexes were accomplished by analytical and spectral (FT-IR, UV-Vis, ^{1}H NMR and ESI-Mass) methods. Furthermore, the catalytic activities of these complexes have been investigated on the oxidation of various alcohols.

Presenting author:

E-Mail: *anitha1180@gmail.com*

Electrochemical study of Neurotoxicities of Ofloxacin antibiotic with Solid supported lipid membrane using double Electrode System

K. Poornima[1], M. Periasamy[2], A. Sankar[3]

[1]*Assistant Professor, Government College of Engineering, Salem*

[2]*Assistant Professor, Thiruvalluvar Government arts College, Rasipuram, Namakkal*

[3]*Assistant Professor, Kandaswami Kandar's College, Velur, Namakkal*

Abstract

Interface of fluoroquinoline antibiotic oflaxacin with Solid supported lipid bilayer membrane system was studied using double electrode system with the help of electrochemical impedance spectroscopy in a alkali bath solutions. Silver-Silver chloride two assembly electrode is constructed as per the standard procudure to study the Neurotoxicities of Ofloxacin. The electrochemical impedance spectra were recorded using a Potentiostat and the analysis of data was done. In all the studies BLM in the absence of the drug is designated as 'bare' membrane and BLM in the presence of drug is designated as drug-doped membrane. The impedance spectra were recorded in the frequency range 1MHz to 10 mHz, at the open circuit potential by superimposing a sinusoidal AC signal of small amplitude 25 mV. The results of this study was analysed to develop an impedimetric sensor for the quantification of ofloxacin without enzymes.

A Comparision between Synthesis of Ibuprofen In Conventional Process And Green Process

K. Venkatesh*

Department of Chemistry, Muthayammal College of Arts And Science

Abstract

A green chemistry was always give its best to control the pollution and has twelve ultimate principles which give a solution to prevent the pollution. Ibuprofen (I) the most widely used as pain killer drugs and has been synthesized in recent years. In conventional process, (I) was synthesized from isobutyl benzene by Friedal Craft Acylation and in presence of ester of Chloroacetic acd and Hydroxylamine to get (I). To avoid derivatization, the Green way was selectively used. Environment Pollution control, reduction of chemical wastage are the benefits of the Green Chemistry.

Presenting author:

E-Mail: *venkateshkuppusamy2407@gmail.com*

Pollution Control by Photocatalyst

S. Arunkumar*

Department of Chemistry, Muthayammal College of Arts And Science

Abstract

TiO_2 nanoparticle – control Air Pollution – having Black hexagonal structure – naturally as oxide of titanium – normally used in Pharma and Cosmetic industries – semiconductor has low band gap and high surface area – exibit Photo catalytic activity under UV irradiation – effectively used as Photocatalyst in control Air Pollution – had strong Oxidative potential convert water molecules to hydroxyl radicals – exposed to pollutant Environment – form ions in the presence of Sunlight – convert Environment Oxygen to Super Oxide anion – further degrades Organic compounds present in the Environment.

Presenting author:

E-Mail: *arunchemistry1998@gmail.com*

Synthesis, Spectral and Antimicrobial Studies of 3*t*-pentyl-2*r*,6*c*-bis(*m*-substituted-phenyl)piperidin-4-ones

D.M. Muniraj, A. Kamaraj

Department of Chemistry, Sri Vijay Vidyalaya College of Arts and Science, Nallampalli, Dharmapuri.

Abstract

A series of 3*t*-pentyl-2*r*,6*c*-bis(*m*-substituted-phenyl)piperidin-4-ones have been synthesized from their respective aldehydes and 2-octanone. The structural assignments of the synthesized compounds have been elucidated based on FT-IR, ^{1}H and ^{13}C NMR spectral studies. All the synthesized compounds have been preliminarily screened for their *in-vitro* antimicrobial activity using disc diffusion method. The results pointed out that the tested compounds have been explored superior inhibition antibacterial activity against the bacterial strains *E. coli*, *S. typhi* and *S. aureus*.

Keywords: *Piperidin-4-one, FT-IR, NMR, Antibacterial activity*

Green synthesis of Magnesium oxide Nanoparticles using *Crossandra infundibuliformis* leaf extract and its antimicrobial activity

M. Nagoor Meeran

Department of Chemistry, Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology, Avadi, Chennai, Tamilnadu, India.

Abstract

Green synthesis of MgO is considered as a potential and eco-friendly way towards the creation of Inorganic metal oxide nanoparticle. Inorganic materials such as metal and metal oxides have attracted a lot of attention over the past decades due to their ability to withstand harsh process conditions. Compared to organic antimicrobials, MgO is regarded a very useful antimicrobial agent. In the present study developed a facile and Eco-friendly method for the synthesis of Magnisium oxide nanoparticles from magnesium nitrate solution using *Crossandra infundibuliformis* extract. The synthesized nanoparticles were characterized using x-ray diffraction (XRD), scanning electron microscopy (SEM) and particle size analyzer (PSA). The sharp peaks by XRD pattern show the crystallinity and purity of magnisium oxide nanoparticles. The shape and morphology were studied by SEM analysis. SEM and PSA analysis shows the nanoparticle size in the range from 50to 100nm. *The* nanoparticles exhibit antimicrobial activity against *B.subtilis, E.coli,* and *A.niger and C.albicans*.

Key words: Magnisium oxide, *Crossandra infundibuliformis* and antimicrobial activity.

Presenting author:

E-Mail: nagoorchem@gmail.com

Augmentation of Polymer based Anionic Sensors for Metal-Ion Capture in Water Media

Haridharan Neelamegan*

Department of Chemistry, School of Science and Humanities,Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology

Abstract

Detection and recognition of anions such as fluoride, nitrate and chloride is an immense area of research interest to the scientific community due to its role in chemical, industrial, food and toxicity. We report a novel polymer based sensor which acts as an anion capsule for the detection of toxic anions present in water, which makes the water free from such kind of anions by simple binding. The sensor is prepared in such a manner that consists of a peculiar urea group on either end of the polymer. The anions binding are analyzed through monitoring with nuclear magnetic resonance spectroscopy which clearly shows the shift for various anions to the core of the sensor. The solid- state demonstration of anion guests by this versatile receptor could be useful in alkali-metal salt separation technology. Qualitative binding of salts of F-, Cl-, AcO-, and NO3- to the ligand used to understand the solution-state behavior of ligand in the presence of these anions. Disappearance of the amide -NH signal is observed immediately after the addition of Fluoride to the DMSO-d6 solution of ligand. Furthermore, targeting the binding of contaminant anions from dilute solution must be combined with specific methods to remove or concentrate the resultant complexes contaminants from the remaining solution. Finally, the systems must be simple enough to scale for application on a large scale. Compared to small molecule, polymers chains with multiple recognition elements can increase both the binding efficiency and recognition selectivity for specific analyses.

Keywords: *amphiphilic, anionic sensors, toxicity, ligand, receptor.*

Presenting author:

E-Mail: *n.haridharan@gmail.com*

Phytochemical Analysis of the Medicinal Plant *Chamaecostus Cuspidatus*

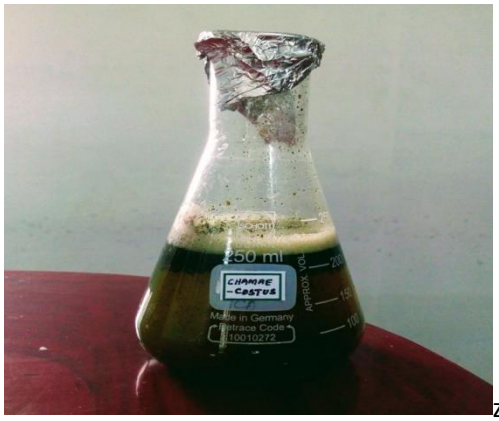
[1]R.P.Subramanian, [1]S.ArunKarthick and **S.Parvathy [2]**

[1]Department of Biomedical Engineering, SSN College of Engineering, Kalavakkam, Chennai.

[2]Department of Chemistry, Government Arts College (Autonomous), Salem-7,TN, INDIA

Abstract

The present study has been designed to investigate the phytochemicals of medicinal plant *Chamaecostuscuspidatus.* Qualitative analysis of the phytochemicals with the leaves of *Chamaecostuscuspidatus* with various solvent extracts.Qualitative phytochemical analysis revealed the presence of alkaloids, flavonoids, saponins, steroids, tannins, phenols, and the absence of glycosides, fixed oils and fats, carbohydrates, protein and amino acids.The phytochemicals further confirmed by quantitative studies.Then the plant extracts was subjected to column chromatography. Isolated fractions were identified TLC.



Keywords: *Chamaecostuscuspidatus, Phytochemicals, Column chromatography, TLC analysis.*

Presenting author:

E-Mail: *kishoresubramanian1998@gmail.com; paruchem70@gmail.com*

Analysis of Bore Water from Different Places in Salem Disrict

[1]R.P.Subramanian, [1]S.ArunKarthick and **S.Parvathy [2]**

[1]Department of Biomedical Engineering, SSN College of Engineering, Kalavakkam, Chennai.

[2]Department of Chemistry, Government Arts College (Autonomous), Salem-7,TN, INDIA

Abstract

Water is the most important thing for a human being because without water human being cannot live. Water means safe water, which we must preserve water and maintain safe water for human beings. Water analyses are carried out to identify and quantify the chemical components and properties of water samples. The type and sensitivity of the analysis depends on the purpose of the analysis and the anticipated use of the water. In environmental management, water analysis is frequently deployed when pollution is suspected to identify the pollutant in order to take remedial action. The analysis can often enable the polluter to be identified.

To determine the water quality from the different bore water sources, the water samples were collected from the different places in Salem, Tamil Nadu, India. The physiochemical parameters of water samples such as pH, alkalinity, Total Dissolved Solid (TDS), Suspended Solids (SS), various ions like calcium, magnesium were analysed and the results obtained were compared with standard values. Environment pollutes the ground water due to so many reasons. Water pollution has great impact on the quality of drinking water. In this regard, the present work created an awareness not to contaminate the existing water sources. Steps must be taken to remove impurities from water and solve the problems arising due to water pollution.

Keywords: *pH, Alkalinity, TDS, SS, Calcium, Magnesium*

Presenting author:

E-Mail: *kishoresubramanian1998@gmail.com; paruchem70@gmail.com*

Analysis of Bore Water Samples of Elampillai In Salem District

[1]**S. Parvathy***, [1]V.Ramjayakumar, [1]G.Soundappan and [2]B.R.Venkatraman

[1]Department of Chemistry, Government Arts College (Autonomous), Salem-7, INDIA
[2]PG & Research Department of Chemistry, Periyar E. V. R. College (A), Trichirapalli, India

Abstract

Water is one of the supreme valuable natural resources known on earth. It is important to all living organisms, most ecological systems, human health, food production and economic development. Today, due to human activity, industrialization, urbanization and negligence of water sources combined with ever growing population has been responsible for water pollution as it is increasingly contaminated with sewage, agricultural chemicals, other pollutants in the environment; therefore pure, safe, healthy and odourless drinking water is a matter of deep concern. There are many pollutants in ground water due to sewage viz., organic and inorganic pollutants, heavy metals, pesticides, fluoride etc; the purpose was to ascertain the quality of water from these sources. Samples were taken from 25 sampling points from different places in Elampillai at Salem Districtand analyzed for pH, EC, TDS, TH, F^-, Ca, Mg, Cl^-, D.O, and Alkalinity using standard techniques in the laboratory. The results were compared with the standard values.

Keywords: *pH, EC, TDS, Ca, Mg, D.O*

Presenting author:

E-Mail: *paruchem70@gmail.com*

Terminal Subsitutuion Of New Pd(Ii) Complexes: Synthesis, Characterization, X-Ray Crystallography And Dna/Protein Binding.

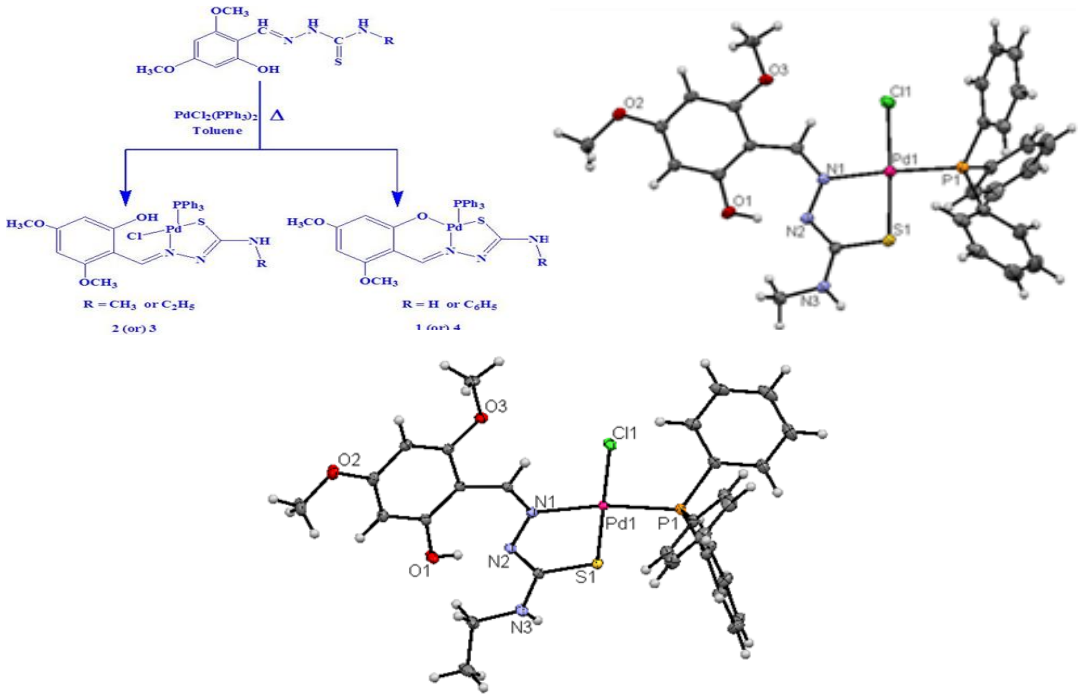
D. Anu[a], P. Naveen[a], Christopher S. Frampton[b] and **M. V. Kaveri[a*]**

[a]*Department of Chemistry, Bharathiar UniversityCoimbatore- 641046, India*

[b] *Wolfson Centre for Materials Processing, Brunel University London, Uxbridge, UB8 3PH, U.K*

Abstract

Four new Pd(II) complexes have been synthesizedby reacting equimolar ratio of $[PdCl_2(PPh_3)_2]$ and 4(N)-substituted 4,6-dimethoxysalicylaldehyde thiosemicarbazone ligands in toluene. The newPd(II) complexeswere analyzed by various spectral and analytical (UV-Vis, IR and NMR) methods and the complexes **2** and **3** are structurally characterized. Crystallographic studies exhibited that the complexes **2** and **3** forming five member ring with ligand $\mathbf{H_2L^2}$and $\mathbf{H_2L^3}$and coordinated as NS donar with bidentate manner and distorted square planer geometry round palladium metal.The binding capability of the new complexes with CT-DNAwas carried out by absorption/emission titration methods. From the results, all the new complexes exhibited intercalative mode of binding with CT-DNA. Further, the protein binding (BSA) studies have been studied by using quenching of tryptophan and tyrosine residues in presence of complexes by taking bovine serum albumin (BSA) as a model and the quenching mechanism was found to be static.



ORTEP diagram of complex 2ORTEP diagram of complex 3

Structural, optical and photocatalytic activitys of selinium doped ZnO nanostructures

N.Siva[1, 2]*, N.Kannadasan[1], D.Sakthi[1], V.Arun[1, 3]

[1]*Department of Physics, E.R.K. Arts and Science College, Erumiyampatti, Dharmapuri 608 002, Tamil Nadu, India*

[2]*Department of Physics, Periyar University, Periyar Palkalai Nagar, Salem, Tamil Nadu 636011, India*

[3]*Department of Energy studies Periyar University, Periyar Palkalai Nagar, Salem, Tamil Nadu 636011, India*

Abstract

Undoped and Se doped (0.05, 0.075, 0.1 and 0.125 M) hexagonal ZnO nanoparticles are synthesized by simple chemical precipitation method. The synthesized particles were analyzed for their structural, optical, morphological, and Photocatalytic activity. The results of X-ray diffraction indicate that the synthesized particles are in hexagonal wurtzite structure with average crystalline sizes in the range of 20-28 nm. The optical absorption measurements indicate the blue shift in the absorption band edge increasing concentration of Se doping. The morphology of the products analyzed by FESEM depicts the presence of spherical and nanosheet structures and majority of them are bearing a size between 25 and 30 nm. The photocatalytic activities of the undoped and doped ZnO are analyzed by the degradation of brilliant green (BG). The results of the degradation reveal that ZnO doped with Se has higher photocatalytic performance than undoped ZnO.

Keywords: *chemical precipitation, photocatalytic, FESEM, degradation, brilliant green*

Presenting author:

E-Mail: *nsivaphy@gmail.com*

Effect of annealing temperature on photocatalytic activity of SnO_2 nanoparticles using a hydrothermal method

S.Suthakaran*, S.Dhanapandian*

Department of Physics, Annamalai University, Annamalai Nagar, Chidambaram 608 002.

Abstract

Tin oxide nanoparticles were synthesized using a simple hydrothermal method. SnO_2 nanoparticles were synthesized by annealing the precursor at different temperatures. The effect of the annealing temperature on the particle size and optical properties of the synthesized SnO_2 nanoparticles were studied by powder X-ray diffraction (XRD), Scanning electron microscopy (SEM), Transmission electron microscopy (TEM), Photoluminescence (PL) and UV–Vis spectra. XRD studies confirmed the tetragonal structure of SnO_2 nanoparticles and calculated particle size was 24 nm. The spherical like morphology was observed in SEM analysis. The transmittance value was found to vary from 60 to 80% in the visible region and the optical band gap value was found to be 3.6 eV. The strong NBE emission present in PL spectrum shows its suitable application for optoelectronic devices. The photocatalytic activity of SnO_2 nanoparticles were tested with methyl blue dye and degradation efficiency was reported.

Keywords: *SnO_2, FESEM, TEM, Optical properties and Photocatalytic activity.*

Presenting author:

E-Mail: suthakaran138@gmail.com

Synthesis and Magnetic properties of Cobalt doped Fe_2O_3 nanoparticles

R.Ramprasath*, S.Sudha, S.Cholan

PG and Research Department of Physics, Sri Vidya Mandir Arts & Science College, Katteri, Tamil Nadu 635307, India

Abstract

We demonstrate here the wet chemical synthesis of cobalt doped Fe_2O_3 nanoparticles and the subsequent effect on magnetic properties with the variation in dopant concentration. It is observed that cobalt can be homogeneously doped into the Fe_2O_3 lattice up to 5 mol% without any appreciable change in the particle size (25 nm). Further increase in cobalt concentration (10 mol% here) resulted in an increase in particle size (35 nm) due to possible adsorption of a cobalt layer on the surface of Fe_2O_3 nanoparticles rather than complete doping in the iron oxide lattice. The dc magnetization measurements showed an increase in saturation magnetization only up to 5%, beyond which it significantly diminished. The reduction in saturation magnetization is attributed to the contribution from surface anisotropy in cobalt coated Fe_2O_3 nanoparticles.

Keywords: Magnetization, Fe_2O_3, Particle size, surface anisotropy

Presenting author:

E-Mail: ramprasath011987@gmail.com

Morphological and Optical characterization of CuO/ZnO core shell nanoparticles

S.Sudha*, R.Ramprasath, S.Cholan

PG and Research Department of Physics, Sri Vidya Mandir Arts & Science College, Katteri, Tamil Nadu 635307, India

Abstract

Monoclinic phase CuO and hexogonal phase of ZnO nanoparticles were synthesized by simple chemical precipitation method. The obtained pristine products were characterized by X-ray diffraction (XRD), thermal gravimetric analysis (TGA), scanning electron microscopy (SEM), transmission electron microscopy (TEM), optical absorption spectroscopy, and photoluminescence (PL) spectroscopy. The XRD confirms cubic structure of the product prepared by under reflux conditions. The product obtained by rheological body synthesis had a mixed phase structure of cubic and monoclinic type. TEM analysis of the as-synthesized powders shows particles with spherical shape and sizes in the range from 10 to 100 nm.

Keywords: *Nanoparticles, simple chemical precipitation, Morphology*

Presenting author:

E-Mail: *sudha.mscphysics@gmail.com*

Development of Empirical Models for the Hydrogenation of Phenol Process

A. Vijay Kanth[1], **U. Appala Naidu[2*],** A. Santhos Kumar[3]

[1]*Department of Chemical Engg., OUCT, Osmania University, Hyderabad, Telangana, India – 500 007.*

[2]*Department of Chemical Engg., B.V.R.I.T, Narsapur, Medak Dist., Telangana, India – 502 313.*

[3]*Department of Chemistry, E.R.K. Arts & Science College, Harur, Tamilnadu, India – 636 905.*

Abstract

In recent years, sustainable development has become the focus of the research throughout the world. It includes, among many other things, development of environment-friendly processes and products. The present research was undertaken on the same line, that is, to produce cyclohexanone (CH) from hydrogenation of phenol. Cyclohexanone, a key raw material in the production of polymer and plastic products. On the other hand, phenol is considered as an environmental toxin and phenolic waste originates from a variety of industrial sources including oil refineries, petrochemical units, polymeric resin manufacturing and plastic units. Catalytic hydrogenation is now emerging as a viable alternative for destructive incineration where hazardous substances are transformed into useful products. The hydrogenation of phenol, as a starting material, produces selectively either cyclohexanol or cyclohexanone or both. The product selectivity mainly depends upon the reaction conditions and more importantly on the nature of the catalysts being used.

In the present work, the liquid phase hydrogenation of phenol was carried out in an isothermal fixed bed catalytic reactor. The effect of reaction parameters on the conversion of phenol and selectivity towards CH was studied. The reactions were carried out in the temperature range of 80-120 ^{o}C and the flow rate of phenol was maintained between 0.05 and 0.5 mol/min. An empirical models were developed to predict conversion of phenol and selectivity towards CH from the obtained experimental data with the help of statistical tools such as Minitab and MS Excel. The observed experimental and predicted data for conversion and selectivity is given in Table 1. From the results, it was concluded that the developed models were good in agreement with the experimental data.

Table 1: Experimental and predicted values of phenol conversion and selectivity of CH.					
Temperature (°C)	Flow rate of phenol (mol./min.)	Conversion of phenol (%)		Selectivity of CH (%)	
		Experimental	Predicted	Experimental	Predicted
80	0.4	45.9	41.5	100	100
100	0.4	69.8	59.4	99.4	99.7
110	0.15	76.9	75.0	99.0	99.1
110	0.5	86.9	81.1	99.2	98.6

Presenting author:

E-Mail: *uanaiduchemz@gmail.com*

ZnO/CdS/Mn ternary nanocomposites: Synthesis, Characterization and enhanced visible light driven photocatalytic performance

V.Arun [a, b], P.Maadeswaran [a,*] T.Pazhanivel [c]

[a] *Department of Energy Studies, Periyar University, Salem – 636 011, India*

[b] *Department of Physics, E.R.K Arts and Science College, Erumiyampatti, Dharmapuri – 636 905, India*

[c] *Department of Physics, Periyar University, Salem – 636 011, India*

Abstract

ZnO/CdS/Mn nanocomposites were successfully synthesized by the chemical precipitation method. X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM), Energy-Dispersive X-ray analysis (EDAX), Transmission Electron Microscopy (TEM), Ultraviolet Diffuse Reflectance Spectroscopy (UV–DRS) and Photoluminescence Spectroscopy (PL) Fourier transform Infrared Spectroscopy (FTIR) were used to characterize the synthesized products. It has been shown that the ZnO/CdS/Mn interface plays a key role in enhancement of photodecomposition of methylene blue (MB) used as a model test noxious waste, under monochromatic light irradiation (400 nm). The increase of photocatalytic activity was attributed to the shift of absorption edge of ZnO/CdS/Mn towards visible light in comparison with ZnO/CdS. The elemental analysis confirmed the presence of elements in the prepared nanocomposites. TEM results showed the prepared nanocomposites are mono dispersed and uniform in size. FTIR, UV–DRS and PL spectra were confined the growth process and enhancement of optical properties. It showed a red shift with respect to the variation of Mn percentage.

Key Words: *ZnO/CdS/Mn, Nanocomposites, Photocatalytic activity, TEM, SEM*

Presenting author:

E-Mail: *maadeswaranp@periyaruniversity.ac.in*

Co doped ZnO/CdS nanocomposites: Study of structural and optical properties synthesis by chemical precipitation method

M. Priya, **D. Sakthi** *

Department of Physics, E.R.K Arts and Science College, Erumiyampatti, Dharmapuri – 636 905, India

Abstract

Co doped ZnO/CdS nanocomposites were successfully synthesized by the chemical precipitation method. X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM), Energy-Dispersive X-ray analysis (EDAX), Transmission Electron Microscopy (TEM), Ultraviolet Diffuse Reflectance Spectroscopy (UV–DRS) and Photoluminescence Spectroscopy (PL) Fourier transform Infrared Spectroscopy (FTIR) were used to characterize the synthesized products. The elemental analysis confirmed the presence of elements in the prepared nanocomposites. TEM results showed the prepared nanocomposites are mono dispersed and uniform in size. FTIR, UV–DRS and PL spectra were confined the growth process and enhancement of optical properties. It showed a red shift with respect to the variation of Co percentage.

Key Words: *Co doped ZnO/CdS, Nanocomposites, Photocatalytic activity, TEM, SEM*

Presenting author:

E-Mail: *rajisakthi84@gmail.com*

Sn doped ZnO/CdS nanocomposites: Study of structural and optical properties synthesis by chemical precipitation method

A. Priyanka**, D. Sakthi** *

Department of Physics, E.R.K Arts and Science College, Erumiyampatti, Dharmapuri – 636 905, India

Abstract

Sn doped ZnO/CdS nanocomposites were successfully synthesized by the chemical precipitation method. X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM), Energy-Dispersive X-ray analysis (EDAX), Transmission Electron Microscopy (TEM), Ultraviolet Diffuse Reflectance Spectroscopy (UV–DRS) and Photoluminescence Spectroscopy (PL) Fourier transform Infrared Spectroscopy (FTIR) were used to characterize the synthesized products. The elemental analysis confirmed the presence of elements in the prepared nanocomposites. TEM results showed the prepared nanocomposites are mono dispersed and uniform in size. FTIR, UV–DRS and PL spectra were confined the growth process and enhancement of optical properties. It showed a red shift with respect to the variation of Sn percentage.

Key Words: *Sn doped ZnO/CdS, Nanocomposites, Photocatalytic activity, TEM, SEM*

Presenting author:

E-Mail: *rajisakthi84@gmail.com*

Cu doped ZnO/CdS nanocomposites: Study of structural and optical properties synthesis by chemical precipitation method

M. Vignesh, **D. Sakthi** *

Department of Physics, E.R.K Arts and Science College, Erumiyampatti, Dharmapuri – 636 905, India

Abstract

Cu doped ZnO/CdS nanocomposites were successfully synthesized by the chemical precipitation method. X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM), Energy-Dispersive X-ray analysis (EDAX), Transmission Electron Microscopy (TEM), Ultraviolet Diffuse Reflectance Spectroscopy (UV–DRS) and Photoluminescence Spectroscopy (PL) Fourier transform Infrared Spectroscopy (FTIR) were used to characterize the synthesized products. The elemental analysis confirmed the presence of elements in the prepared nanocomposites. TEM results showed the prepared nanocomposites are mono dispersed and uniform in size. FTIR, UV–DRS and PL spectra were confined the growth process and enhancement of optical properties. It showed a red shift with respect to the variation of Cu percentage.

Key Words: *Cu doped ZnO/CdS, Nanocomposites, Photocatalytic activity, TEM, SEM*

Presenting author:

E-Mail: *rajisakthi84@gmail.com*

Mn doped ZnO/CdS nanocomposites: Study of structural and optical properties synthesis by chemical precipitation method

V. Kavitha [a] V.Arun [a, b], P.Maadeswaran [b, *], T.Pazhanivel [c]

[a] *Department of Physics, E.R.K Arts and Science College, Erumiyampatti, Dharmapuri – 636 905, India*

[b] *Department of Energy Studies, Periyar University, Salem – 636 011, India*

[c] *Department of Physics, Periyar University, Salem – 636 011, India*

Abstract

Mn doped ZnO/CdS nanocomposites were successfully synthesized by the chemical precipitation method. X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM), Energy-Dispersive X-ray analysis (EDAX), Transmission Electron Microscopy (TEM), Ultraviolet Diffuse Reflectance Spectroscopy (UV–DRS) and Photoluminescence Spectroscopy (PL) Fourier transform Infrared Spectroscopy (FTIR) were used to characterize the synthesized products. The elemental analysis confirmed the presence of elements in the prepared nanocomposites. TEM results showed the prepared nanocomposites are mono dispersed and uniform in size. FTIR, UV–DRS and PL spectra were confined the growth process and enhancement of optical properties. It showed a red shift with respect to the variation of Mn percentage.

KeyWords: *Mn doped ZnO/CdS, Nanocomposites, Photocatalytic activity, TEM, SEM*

Presenting author:

E-Mail: *maadeswaranp@periyaruniversity.ac.in*

Structural and Morphological Ni Doped MnO_2 Nanocrystals

S. Anusuiya*, N.Kannadasan[1], D.Sakthi[1], V.Arun[1, 2]

[1]*Department of Physics, E.R.K. Arts and Science College, Erumiyampatti, Dharmapuri 608 002, Tamil Nadu, India*

[2]*Department of Energy studies Periyar University, Periyar Palkalai Nagar, Salem, Tamil Nadu 636011, India*

Abstract

Pristine MnO_2 and various levels of Ni doped MnO_2 nanocrystals have been synthesized by a chemical precipitation processes and characterized by various techniques. The X-ray diffraction patterns show the tetragonal structure of α-MnO_2, The FTIR spectrum confirms the presence of Mn-O bonds. Morphological studies show the synthesized particles to be nanospherical structure.

Keywords: *MnO_2, Precipitation, FE-SEM, nanospherical*

Presenting author:

E-Mail: nkannadasan87@gmail.com

Structural, Morphological and Anomalous magnetic properties of antiferromagnetic CoO nanarticles

D. Umanath*, N.Kannadasan[1], D.Sakthi[1], V.Arun[1, 2]

[1]*Department of Physics, E.R.K. Arts and Science College, Erumiyampatti, Dharmapuri 608 002, Tamil Nadu, India*

[2]*Department of Energy studies Periyar University, Periyar Palkalai Nagar, Salem, Tamil Nadu 636011, India*

Abstract

Antiferromagnetic CoO nanoparticles ranging from 10 to 40 nm were prepared by the simple chemical precipitation method. The morphology, size and structure of the particle were characterized by TEM microscopy, electron diffraction and X-ray diffraction. Magnetic properties were measured using VSM magnetometers. The nanoparticles has an FCC structure with a lattice parameter of 4.258 Å. Anomalous magnetic properties, such as hysteresis, were observed in CoO nanoparticles comparing to the course grain materials. The particle size is reduced, but decreases when the size is less than 20 nm. The magnetization increases below 100 K for the nanoparticles.

Keywords: *Antiferromagnetism, Nanoparticles, Magnetization curves, Hysteresis*

Presenting author:

E-Mail: nkannadasan87@gmail.com

Preparation and characterization of ZnO/ZnS core/shell nanocomposites through a simple chemical method

M. Karthika*, N.Kannadasan[1], D.Sakthi[1], V.Arun[1, 2]

[1]*Department of Physics, E.R.K. Arts and Science College, Erumiyampatti, Dharmapuri 608 002, Tamil Nadu, India*

[2]*Department of Energy studies Periyar University, Periyar Palkalai Nagar, Salem, Tamil Nadu 636011, India*

Abstract

In this paper, we reported the preparation of ZnO/ZnS core/shell nanocomposites nanaoparticles via a simple chemical precipitation method. The precursors of bare ZnO nanoparticles and ZnO nanorods were synthesized by a simple chemical precipitation method. The structural, morphological, and element compositional analysis of bare ZnO nanostructures and ZnO/ZnS core/shell nanocomposites were characterized by X-ray diffraction (XRD), field emission scanning electron microscopy, energy-dispersive X-ray spectroscopy, and transmission electron microscopy techniques. The XRD results indicated that the phase of bare ZnO nanoparticles and ZnO nanorods was wurtzite structure, and the phase of coated ZnS nanoparticles on the surface of bare ZnO nanostructures was nanospherical structure with the size of about 8 nm. Photoluminescence measurement was carried out, and the PL spectra of ZnO/ZnS core/shell nanocomposites revealed an enhanced UV emission and a passivated orange emission compared to that of bare ZnO nanostructures. In addition, the growth mechanism of ZnO/ZnS core/shell nanostructures through hydrothermal method was preliminarily discussed.

Keywords: *ZnO/ZnS core/shell*, *Precipitation*, *photoluminescence*, *growth mechanism*

Presenting author:

E-Mail: nkannadasan87@gmail.com

Synthesis and characterization of ZnO/TiO_2 composite core/shell nanoparticles arrays by chemical precipitation method for photocatalytic applications

N.Siva[*1, 2], N.Kannadasan[1], D.Sakthi[1], V.Arun[1, 2]

[1]*Department of Physics, E.R.K. Arts and Science College, Erumiyampatti, Dharmapuri 608 002, Tamil Nadu, India*

[2]*Department of Physics, Periyar University, Periyar Palkalai Nagar, Salem, Tamil Nadu 636011, India*

[3]*Department of Energy studies, Periyar University, Periyar Palkalai Nagar, Salem, Tamil Nadu 636011, India*

Abstract

ZnO/TiO_2 core/shell nanoparticles arrays were precipitated via a simple chemical process. Effects of solution pH for ZnO, annealing temperature, growth time and temperature on the physical properties of nanoparticles have been investigated. XRD analysis and SEM microscopy were employed to characterize the structural and morphological properties of the prepared composite nanoparticles. XRD result revealed wurtzite structure of ZnO with a mixed anatase & rutile structure phase for TiO_2. EDX and UV-Vis spectroscopy were used to study the chemical composition and optical properties of the films, respectively. The optical properties of the bare TiO_2 nanoparticles and core/shell composite were compared together. The results showed that owing to smaller band gap, the core/shell structure as an electron transport layer for inverted photcatalyst more suitable than bare TiO_2 nanoparticles.

Keywords: composite, ZnO/TiO_2 core/shell; nanoparticles arrays; precipitation

Presenting author:

E-Mail: *nsivaphy@gmail.com*

Studies on synthesis, characterization and biological activity on thiazole-salal derivative of transition metal complexes

S. Sathiyaraj[1,*], K. Sampath[2] and P. Indhumathi[3]

[1]*Department of Chemistry, Dr. N.G.P. Arts and Science College, Coimbatore- 641048, Tamil Nadu, India.*

[2]*Department of Chemistry, Kumaraguru College of Technology, Coimbatore- 641049, Tamil Nadu, India.*

[3]*Department of Chemistry, Shri Nehru Maha Vidyalaya College of Arts & Science, Coimbatore-641050, Tamil Nadu, India.*

Abstract

The Copper, Nickel and Cobalt complexes of the thiazole-salal derivatives were synthesized from the reactions of metal salt solution with Schiff base ligand. The synthesized ligands and complexes were characterized by various physio-chemical techniques like CHNS, FT-IR, UV-Visible, NMR spectroscopy. Binding analysis of the ligands and complexes were carried out in UV-Visible spectrophotometer which reveals that the ligands and complexes bind to DNA *via* electrostatically. Further, the efficiency of the cytotoxicity of the ligands and complexes to arrest the growth of human tumor cell lines has been studied by MTT assay along with cell viability test under *in vitro* conditions. The IC_{50} value of the ligands and complexes clearly shows the cytotoxic potential against tumors.

Key words: Copper, Nickel, Cobalt, Schiff base, Cytotoxicity

Presenting author:

E-Mail: *sathiyarajs85@gmail.com*

Synthesis and characterization of a new non-centrosymmetric crystal from L-Histidine family for optoelectronic applications

Muppudathi Anna Lakshmi[1], Madhu bala[2] and Jeyaperumal Kalyana Sundar[2*]

[1] Department of Physics, ERK Arts and Science College, Erumiyampatti, Dharmapuri, India

[* 2] Materials Science Laboratory, Department of Physics, Periyar University, Salem- 636 011, India

Abstract

In current technological world, the need of efficient nonlinear optical material is a key role in material science for optoelectronic applications. A new non-centrosymmetric crystal L-Histidinium trichloro cadmium (HCC) was grown by slow evaporation method. The crystalline structure of the material was explored with single crystal X-ray diffraction analysis. The functional groups present in the molecule was confirmed by vibrational analysis. The material hold more than 80 % transmission in the entire visible region and the cut-off wavelength is 240 nm. The thermal decomposition and melting point were explored by thermal analysis and it reveals that the material is thermally stable upto 217 oC. The crystal gives 1.4 time greater second harmonic generation efficiency compared to typical KDP material. All the structural and optical results reveals that HCC crystal is prominent material for second harmonic generation applications.

A Spectroscopic investigation of Schiff base with β–cyclodextrin and bovine serum albumin

M. Sathya *

* Department of Chemistry, Muthayammal College of Arts and Science, Namakkal

E-mail: chmsa2@muthayammal.in

Abstract:

3-[(E)-(phenylimino)methyl]-4H-chromen-4-one (PIMC) belongs to the Schiff base compound, has an antibacterial activity. The binding properties of PIMC with the host molecule β-cyclodextrin (β–CD) and its interaction with Bovine Serum Albumin (BSA) in free and β–CD complexed forms are studied using UV-Vis and fluorescence spectroscopy. The Stern–Volmer constants and the binding constants for the BCA–BSA binding in the presence and absence of β–CD are determined. Molecular modeling is used to optimize the sites and mode of binding of BCA with BSA. Förster Resonance Energy Transfer (FRET) studies are carried out and the proximity of the interacting molecules is reported in the presence and absence of β-CD.

Synthesis and spectral characterisation, in vitro cytotoxicity activity of 2-amino 4-methoxy6-methyl pyrimidine based metal complexes .

Ramkumar. A [1]* sujatha muthusamy [2], sathya nagarajan [2]

[1] Department of Chemistry, E.R.K Arts and Science College, Erumiyampatti

[2] Department of Chemistry, Chikkanna govt arts college, Tirupur

E-Mail: chinagoundaramu@gmail.com

Four coordinated Co(II) and Cu(II) Schiff bas3 complex of general formula [M(PPh3)L](where L = Mono nucleating mono basic bidentate Schiff base were derived by condensing carbonyl compounds and 2-amino 4-methoxy6-methyl prymidine in equimolar ratio in ethanolic medium. Metal complexes have been synthesised and characterised by elemental analysis, spectral studies (FT-IR, NMR and uv-vis) confirms the monoclinic structure of the ligand. A square planar geometry has been tentatively proposed for all the new complexes. The new complex [Co(PPh3)L] and [Cu(PPh3)L] exhibit modrate DNA binding, antibacterial and anti cancer activity assays.

Keywords: Schiff base, elemental analysis, spectral studies, square planar geometry, cytotoxicity, anti bacterial study.

Reactive oxygen species (ROS)-responsive microspheres for targeted drug delivery of camptothecin

Srinivasan Ayyanaar [a], Jegathalaprathaban Rajesh [b], Gurusamy Rajagopal [a]*

[a] Department of Chemistry, Chikkanna govt arts college, Tirupur

[b] Department of Chemistry, Madurai Kamaraj University, Madurai

ABSTRACT

Non-selectivity of drugs used in the treatment of cancer inevitably leads to destruction of rapidly dividing normal healthy cells. In order to overcome this limitation a wide variety of targeted drug delivery systems have been reported. Among them, micro particulate drug delivery is a one of the most efficient routes and lacks responsiveness to external stimuli. In order to overcome this limitation a new drug delivery system based on reactive oxygen species (ROS) sensitive tween 80 coated magnetic iron oxide nanoparticles was developed. The rationale for this study is based on the literature reports that cancer cells accumulate oxygen free radicals at higher concentrations. The cancer chemotherapeutic agent camptothecin (CPT) was encapsulated in PLGA-PVA magnetic microspheres (CPT-MMSs) and its responsiveness to ROS was demonstrated by the specific release of camptothecin in the presence hydrogen peroxide. The experimental observations showed more marked cytotoxicity in human cervical cancer (HeLa) cancer cells mediated by CPT-MMSs as compared to tween 80 coated magnetic iron oxide nanoparticles (MIONs) and CPT alone.

Synthesis and Characterization of Cu^{2+} doped ZnO Nanoparticles Obtained via Chemical Co-Precipitation

S.Thambidurai[a] and P.Gowthaman[b]

[a] Sri Vidya Mandir Arts and science college, Uthangarai, Tamilnadu, India.

[b] Erode Arts and science college, Erode, Tamilnadu India.

Abstract:

Pristine and Cu doped ZnO nanopowders were synthesized by very simple chemical Co-precipitation method by varying copper concentration as 0.03, 0.06 and 0.09 mol for dye degradation test. Dense nanoparticles of wurtzite structure with preferential growth of (101) were formed. The crystallite size decreases when the Cu content is increased. The photoluminescence results confirm the shift of near band edge emission towards the lower wavelength with increasing doping concentration. Energy dispersive X-ray analysis (EDX) studies confirms the presence of Zn, O and Cu elements in the prepared nano powders. Photocatalytic activity test was conducted for the prepared nanopowders against Methylyne Blue (MB) dye under visible light. The observed results show that the photocatalytic efficiency of the prepared nanopowders increase with the increase of Cu content.

Keywords: ZnO nano powders, Cu – ZnO, Structural and Optical Studies, Photocatalytic activity.